THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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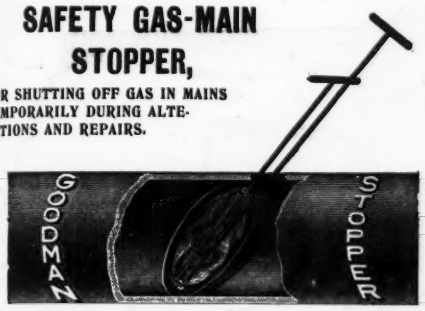

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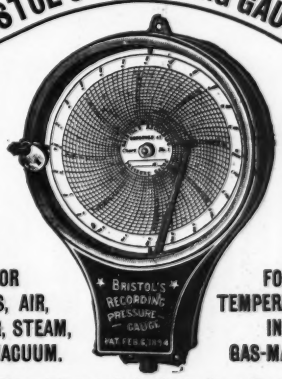

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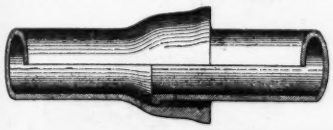

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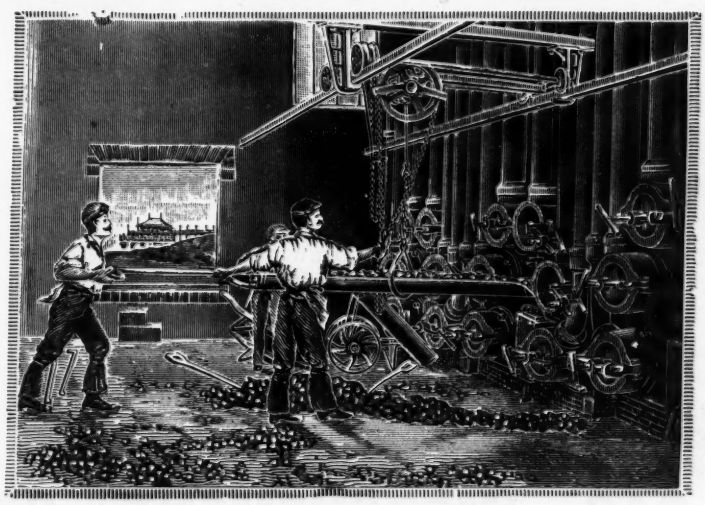

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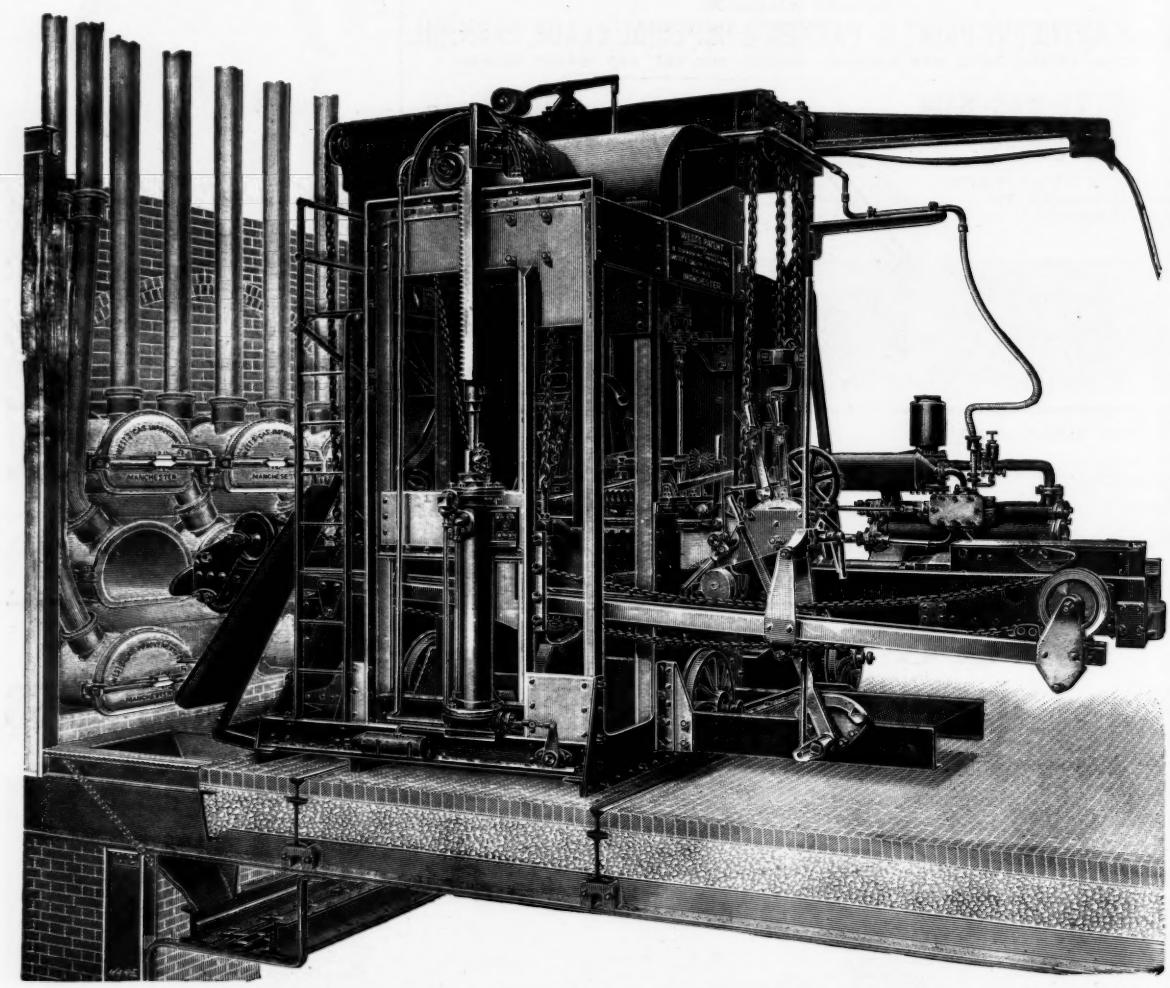

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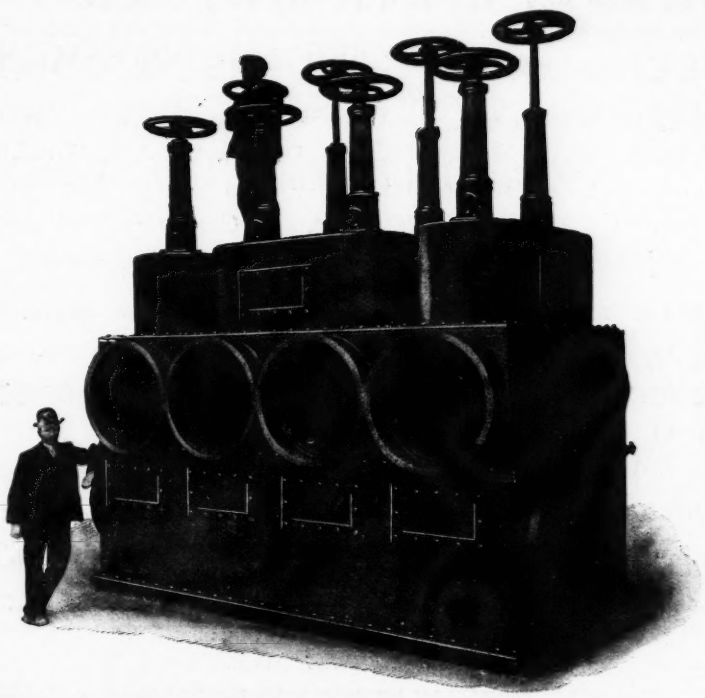

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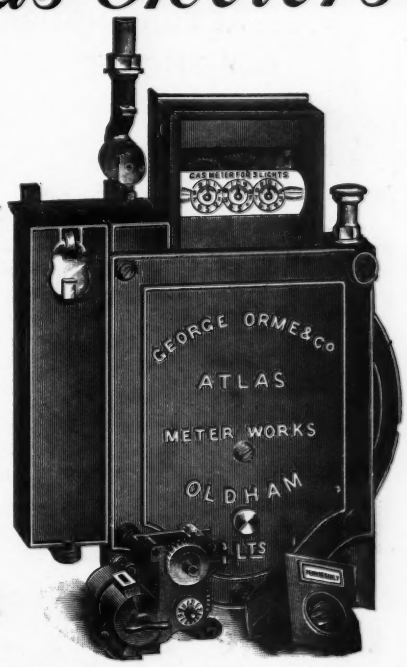

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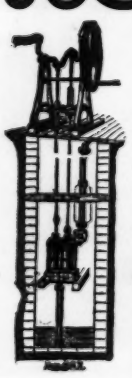

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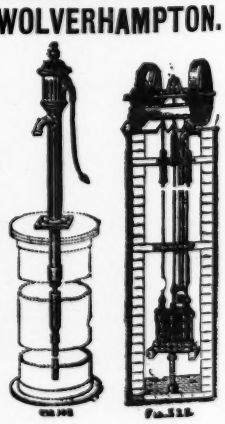

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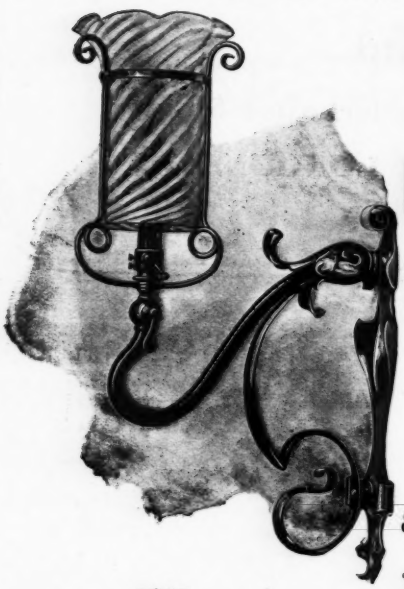

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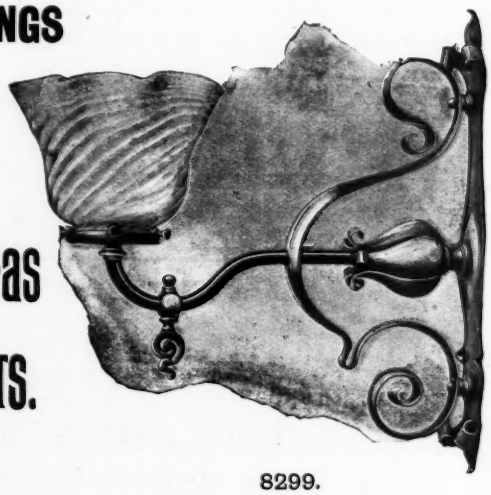

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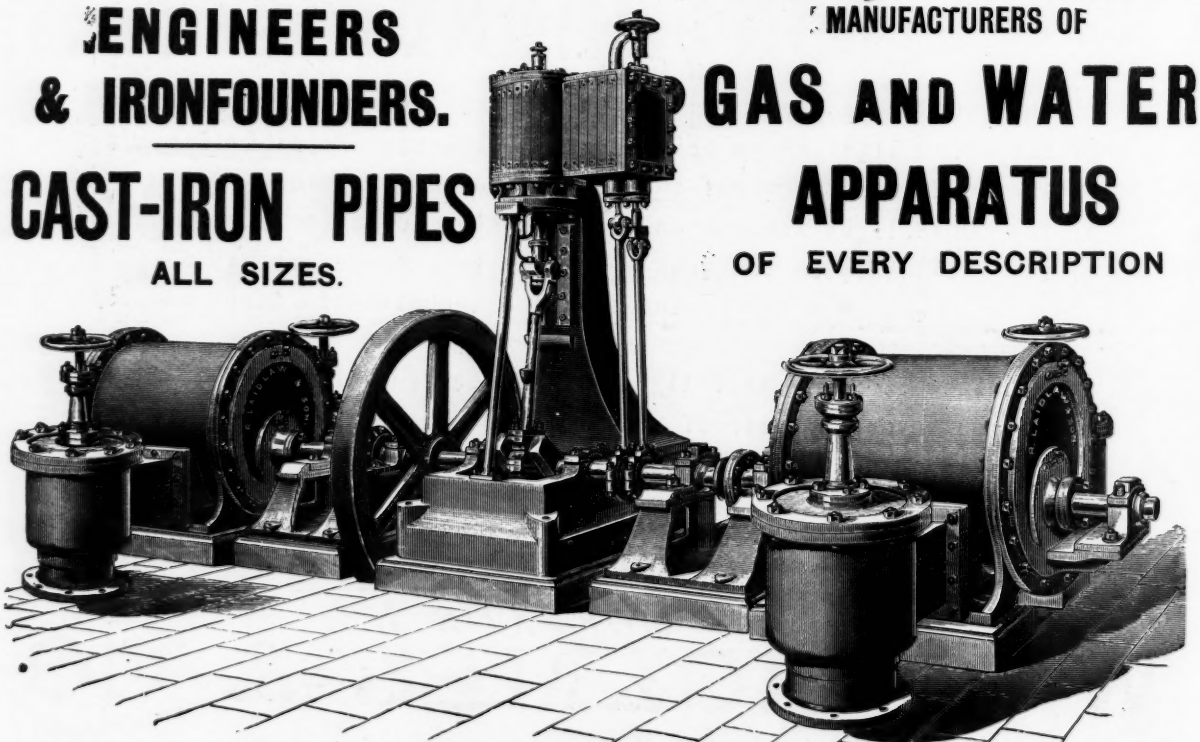

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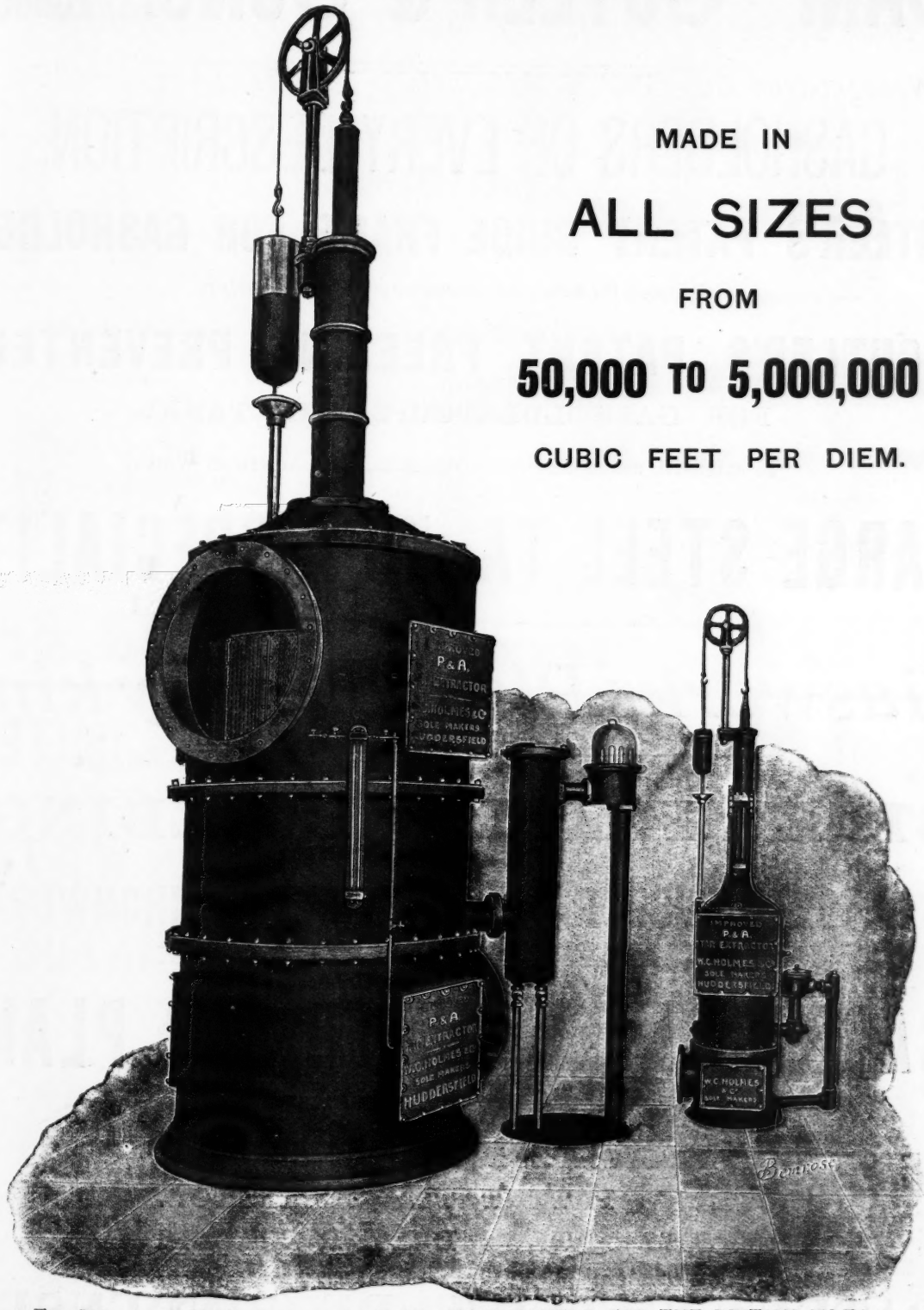

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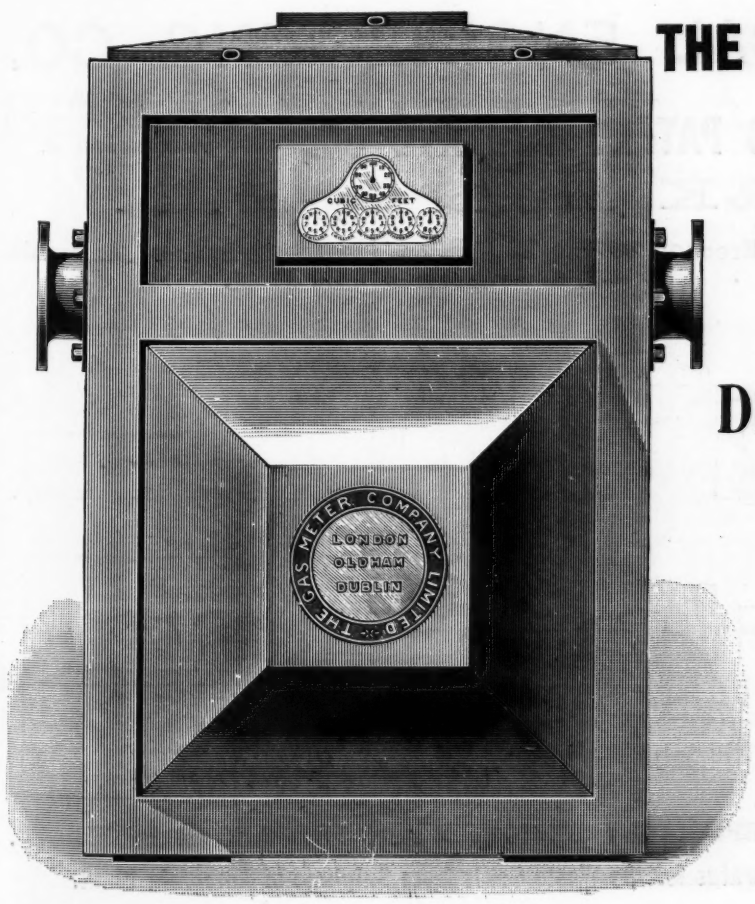

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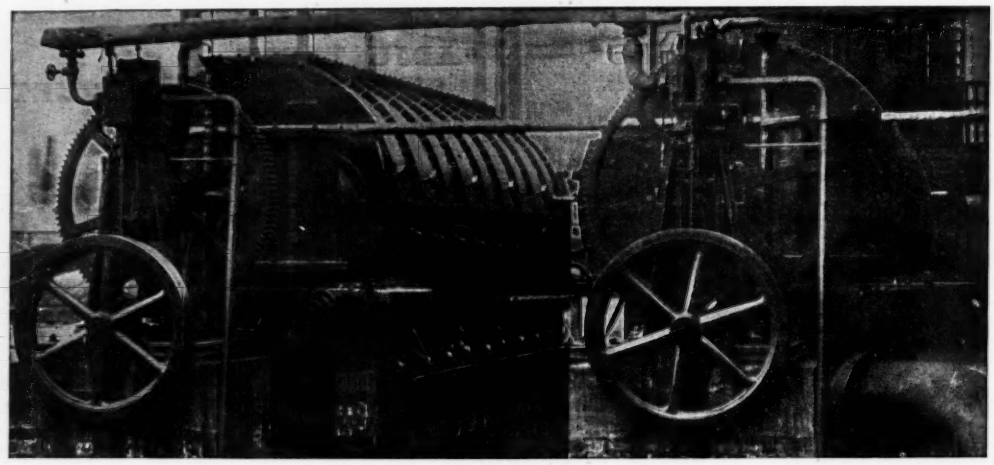

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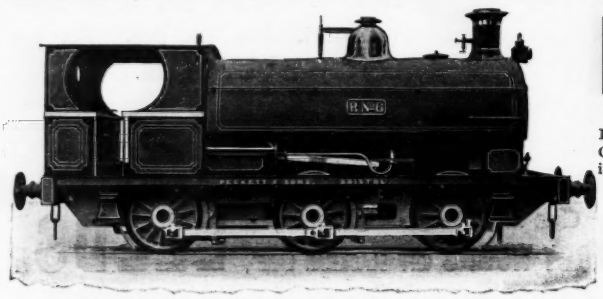

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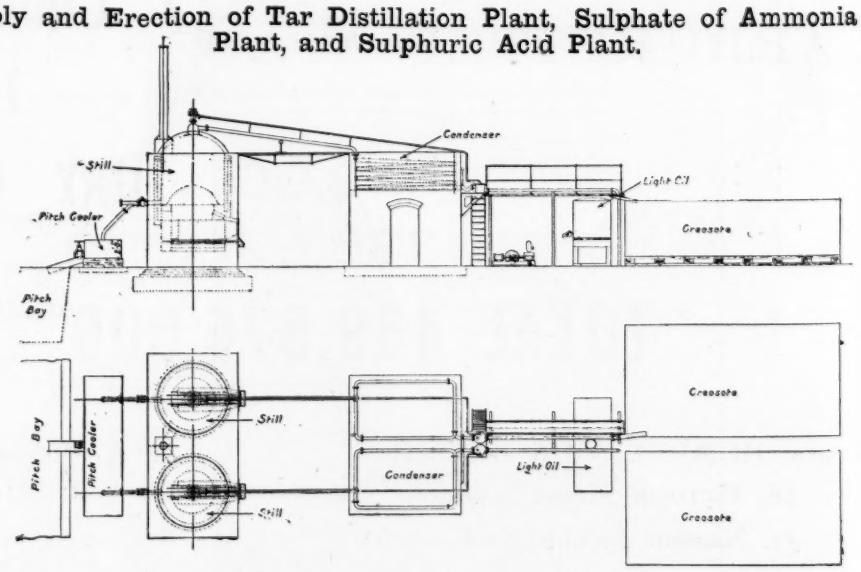

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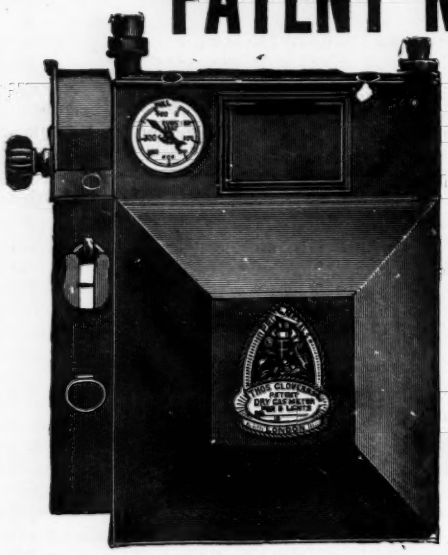

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES.

The Sale of Gas for Power Generation.

ONCE more it is our duty to draw the attention of gas directors and members of the gas committees of local authorities to the necessity for something being done to meet the cut-throat competition, often rate-aided, of suppliers of electricity. Fair competition is the life of trade, and no gas company can reasonably object to the electricity supplying company in their district straining every nerve to work up business. The alternative in their case is bankruptcy; and it would be a good thing if the shadow of the Receiver were more dreaded than it is by those gas directors who appear to think that the provision of their usual dividends is an operation of Nature. Many of these gentlemen discourse glibly enough to the shareholders gathered together in general assembly about meeting competition with competition; but when it comes to action, they will neither move a finger nor spend a single shilling to do business as it should be done. The reason, perhaps, is that most gas company chairmen are relics of the ante-competition period, when all manner of discouragement was offered to anybody who had the presumption to wish to get upon the company's books as a consumer. Be this as it may, the slowness to move, and obliviousness to the most ordinary commercial enterprise, of many gas directors is truly scandalous. Their supineness is not to be screened by putting forward the engineer and works manager, or perchance the secretary, as the person who should be responsible for looking up business. This does not properly fall within the ordinary duties of these officers, who would not even be thanked if they were to display any zeal of the shopkeeping kind.

Take, for example, the enterprise with which those who have to sell electricity offer to cater for every conceivable requirement. They are not tied down in any way, either by law or tradition. They are not subject to harassing photometrical tests, either. But that is another story. The present point is that, subject to the one requirement to treat everybody alike—which is the only statutory restriction of their liberty in trading to suit themselves and their customers—electricians can go as they please. Discounts for large consumption or prompt payment, or special terms for any particular requirement, come natural to them, and contrast unfavourably to the latter with the cast-iron and mostly antiquated forms of gas charges. One thing they insist upon, for which gas companies in general have reason to shake hands with them—they always charge meter-rent. Since the advent of electricity-meters, the once popular agitation against gas-meter rent, and the hoary witticisms at the expense of the meter, have together died away. Both in dearness and moral character, the electricity-meter eclipses the worst reputation of the gas-meter. Those gas companies who gave up charging meter-rent in districts now overrun by their electrical rivals must be sorry for it. There can be no real justification for keeping a stand-by gas-meter, eating its head off, upon the premises of a customer who has definitely gone over to the opposition shop; and it can scarcely need arguing that when gas companies agreed to supply meters gratis, it was upon the assumption that they would be used.

One great point with the purveyors of electricity at the present time is the endeavour to establish a "power" connection. They are willing and anxious to do anything and everything, if only they can sell power, to supplant gas and steam engines. How far they are commercially justified in making extravagant bids for this class of custom may be debateable. The salient point is that they are now doing it everywhere. There is scarcely an electric light undertaking in the country from which power cannot be had at something like the average works cost, or even less. The Manchester Corporation Electricity Committee are going to do it at 1¼d. per unit, and so endeavour to undersell their brethren of the Gas Committee. A well-known firm were recently approached by the West Ham Borough Electricity Department with an offer of power on the basis of any reduction that could be agreed upon on the lowest quoted price of 1¼d. per unit. As this offer was of a quite private nature, who is to know what contracts are entered into upon similar lines?

If it is worth the while of electricity dealers to make these sacrifices for a power connection which they appear to so greatly desire, it must be equally to the advantage of all sellers of gas to do something similar. What are the latter doing? Some interesting disclosures relating to the progress of electric motors in popular favour, even in competition with cheap gas, were recently published at an electrical engineers' meeting in Leeds. It was claimed that at the cut rate of 1d. per unit the public would take to electric motors, with gas offered at 1s. 6d. per 1000 cubic feet. The obvious rejoinder to this would be: Offer the gas at 1s. per 1000 cubic feet, and see what happens. Bradford is ahead of other towns in taking distributed electrical power, having 4398-horse power connected, requiring about 450 units per annum per horse power. This works out to a rental of about £8250—quite worth having, if it is only turning the money over. Even so, it must be nearly twice as dear as gas at local rates. It is with the supply of power as with public lighting—the branch is worth cultivating for the advertisement as well as for its own sake; and it is a pity that gas manufacturers do not see it more in this light.

Two Association Meetings.

THIS week we have to report the proceedings at two district meetings of gas engineers and managers. The happening of two such technical gatherings in one week is not a matter that, from the journalistic point of view, is altogether appreciated, and the plethora of reading matter that they provide must also be a bit exasperating to readers. But on this occasion the proximity of the two meetings was unavoidable. The first was that of the Midland Association on Thursday, when the popular Hon. Secretary of many years' standing (Mr. Charles Meiklejohn, of Rugby) succeeded Mr. Charles Hunt in the chair. The address of the new President was the feature of the occasion; and its delivery showed that in some respects Mr. Meiklejohn was in a particularly good fighting mood—though all in a friendly way. As some of the points demand fuller attention than is usually given to Association meetings in this part of the "JOURNAL," we have dealt with them in an article elsewhere—of course, with the like amicable feeling displayed by Mr. Meiklejohn.

The second meeting was that of the members of the Manchester District Institution on Saturday. With the change in the occupancy of the presidential chair—from Mr. Arthur Graham to Mr. S. R. Ogden—the Institution has completed one-third of a century's work; and it is gratifying on such an occasion to be able to endorse, from independent observation, the recognition by the Committee in their report of "the increasing vitality of the Institution, and the "growing desire of the younger members to participate in "the responsibilities as well as the privileges of member-"ship." As is remarked by the Committee, this augurs well for the future success of the organization; and it must redound to the advantage of the industry generally. There is a robustness about the Manchester Institution that is distinctly refreshing; and any check in the development of its usefulness appears to be a very remote contingency. By the affiliation with the old organization of a commercial department, the members have moved a step ahead of all other of our district technical associations. To an extent the new idea, while it has assumed definite shape, is on trial; the intention being that, the feasibility of the departure having been proved on a small scale, it shall be worked, under the protection of the Institution and through District Committees, gradually to see how far it can be carried to serve useful ends. The matter was fully discussed at the time of the Hebden Bridge meeting in the autumn of last year; and Mr. Ogden, in the address with

which he inaugurated his year of office as President on Saturday, made further extended allusion to it, and showed the large possibilities for good work and reciprocal influence that the scheme possesses.

We have introduced the subject here so as to specially emphasize the appeal made on Saturday by Mr. S. Meunier—the prime mover in the scheme—to those gas undertakings who have not replied to the Committee's invitation to unite in this proposal for the promotion of their common interests. It may be that there are some who are waiting to see whether or not the movement will turn out a success; but this, it should be understood, is one of those projects the prosperity of which is in direct relation to the number of adherents. Therefore, to give the scheme the largest measure of opportunity for proving itself, the more there are who reply in the affirmative the better; and to relieve the Secretaries of the sections of the doubt as to whether certain undertakings are going to join or not, an answer one way or the other would be simply an act of courtesy. The sceptical ones will perhaps be assisted in their decision by a careful perusal of the President's remarks on the subject. One suggestion more. While matters affecting the inner working of the commercial department should not be divulged excepting to members, we hope that the Committee will constantly report progress, and all new developments, for the benefit and (if successful) stimulation of others beyond the bounds of the Institution's district.

Particularly in the appropriateness of the subject-matter, Mr. Ogden's address has justified the members in their selection of President. The deliverance is really a statement of his professional creed. He does not treat with disdain outside threatenings; and he displays an admirable keenness and perception in the choice of the best weapons wherewith to arm himself. He believes in the pushing of incandescent lighting of all grades to the utmost extent, and in making large reductions in price to keep hold of customers in the great industrial hives of the North, in opposition to Mond and other producer gases. In this connection, too—Corporation Gas Engineer though he is—he marks as "unfair" the practice of paying large sums to the relief of rates from gas profits. He confesses, too, the desirability of a reduction of standards of illuminating power; and, lastly, he looks hopefully upon Professor Vivian B. Lewes's proposal to introduce blue water gas into coal gas as it is being made for the purpose of taking up those lighter oils of illuminating value which are at present lost by condensation. The President has himself made some experiments in this direction; but the results, it will be seen, are a little disappointing. This, however, may be due to the fact that he has only been able, under his present circumstances, to work intermittently; and his intention to make provision to enable him to increase the quantity of water gas dealt with may end in greater gratification. It will also be remarked that Mr. Ogden suggests a set of comparative items making up the cost of gas manufacture under the systems of hand and machine stoking and inclined retort working. These items might well form the basis for criticism and suggestion in trying to arrive at an acceptable and comparable method of stating retort-house cost for horizontal and inclined working. The address exhibits the President's advanced views, and his intimate acquaintance with the live gas questions of the day.

Besides the address, two papers occupied the members—the first being that of Mr. Henry Fowler, on "Working " with an Illumination Photometer." This paper, it will be remembered, was prepared for the previous meeting; but time did not then permit of its consideration. In some "JOURNAL" comments on the subject in December, it was suggested that Mr. Fowler would add to the indebtedness of the profession if he would include some results and curves obtained under larger and more varied conditions than those incorporated in the paper as originally prepared; and we have to thank him for readily complying. It must be admitted that the supplementary matter and diagrams (which we shall publish next week) are not to the gas engineer by any means the least interesting part of the paper. We can only repeat that it is to be hoped the contribution will be an incentive to other gas engineers to pursue the interesting study which the illumination photometer opens out to them. The instrument might be used to assist in the solution of the question as to which is preferable for ordinary street lighting—lamps of considerable power widely spaced, or smaller units situated at closer intervals. Mr. W. Everitt must be congratulated upon the discussion that his contribution on "Tar Fog" raised. The paper was a practical one, short, neatly phrased, and the points readily graspable—all of which aided in the eliciting of a really good debate. The three full hours that were occupied by Saturday's meeting was time very profitably spent.

The Yearly Statistical Table of the London Gas Companies' Results.

IN another part of the "JOURNAL" will be found our annual statistical statement relating to the London Gas Companies. It will still be necessary to wait for a year before the figures giving the total amount of the capital employed by the Companies can be restored to the equality of meaning that was destroyed by the application of the principle of stock conversion. For other reasons, the interpretation of some of these statistical data calls for wariness. The supply of gas in the Metropolis is an enormous business, of which the earnings last year amounted to £6,348,598, requiring an expenditure on revenue account of £4,800,607; thus leaving a gross profit of £1,547,991. The hasty observer, noticing that the income of the three Companies fell off for the year £712,588, might jump to the conclusion that the business is a failing one. Certainly, it would not take long to extinguish every gas light in London, if this large decrease of earnings were referable to diminishing trade. Seeing, however, that the cost of carrying on the business was reduced even more—showing an economy of £874,883—it is to be naturally concluded there is another meaning of the figures, which is, of course, the true one. The profit of all the undertakings was £162,295 more than that for the previous year; which puts quite another face on the statistics. This huge industry is evidently adjusting itself once more, as it has to do occasionally, to an alteration of the market conditions, which are again tending in the direction of cheaper gas. The saving of £803,743 in the cost of raw materials of gas manufacture is the controlling factor of the situation. The depreciation in the value of gas-works residuals, aggregating £239,417 for London, is a very serious matter. One of the signs of happiest augury in these tables is the increase of meter and stove rental, meaning, as it does, so many more profit-earners. It is rather a pity that the only place for what are called "extraordinary expenses" is with the entry for bad debts, for it makes this item look very formidable. The progress of improvements in retort-house management is indicated in one place by a decrease of more than £1000 a week in carbonizing wages. Rates and taxes are, of course, again higher. It is well to have this reminder that the London Gas Companies among them contribute £381,394 towards the Metropolitan rate funds. Would the business assist the rates more if it were carried on expressly for the purpose by some local authority?

The following table exhibits at a glance the carbonizing work of the Companies, in a way that is not to be had elsewhere:—

TABLE *showing the Residuals produced and the Gas made per Ton of Coal and Cannel by the Metropolitan Gas Companies in the Year* 1902.

Name of Company.	Coke.	Breeze.	Tar.	Am. Liq.	Gas.
	Cwt.	Bushels.	Gallons.	Gallons.	Cub. Ft.
CHARTERED	12 44	4·15	10·07	30 82	10,156
COMMERCIAL	12·21	5 11	11·95	34·30	10,438
SOUTH METROPOLITAN .	12 35	5·50	9 58	32 33	10,434
Mean per Ton	12·40	4·72	10·00	31·61	10,277

The figures show a marked approximation of all the different managements to a common standard, which is understood rather than expressed. The production of gas per ton of coal has gone up considerably—by 348 cubic feet per ton on the average—for the year. In the special case of the South Metropolitan make, the gain is 552 cubic feet per ton; which is, besides, all coal gas. This fact recalls the time when the South Metropolitan ideal was a low yield of comparatively rich gas. That seems a long time ago. At any rate, the circumstances, and with them the practice, of the Company have greatly altered already; and they will most probably alter more in the ensuing few years, while the Engineers are learning how to make 14-candle gas.

The South Shields Street Gas Explosion Case.

An interesting and very important street explosion case, bearing upon the mutual relationship and responsibilities of statutory gas and electricity distribution—with sewerage works intervening—has just been decided in the Gas Company's favour at the Durham Assizes. The South Shields Corporation were suing the South Shields Gas Company in respect of an explosion of gas which occurred on the morning of the 11th of January last year, when the Corporation lamplighter switched off the current from the incandescent electric lamps attached to an arc lamp standard in Commercial Road, South Shields. The footpath was blown up for a length of 420 yards, and manhole covers were thrown high into the air. There was never any question as to the facts. When Mr. T. H. Duxbury, the Gas Company's Engineer, arrived on the scene, he found gas most unmistakably at an end manhole; and upon tracing the conduit down to a lower level, at a considerable distance from the point of ignition, a ¾-inch lead service-pipe was discovered to be broken away from the ferrule by which it had been connected to a 12-inch gas-main. This gas service-pipe passed under the electric cable conduits, which at this particular spot showed sinking and actual fracture; so that the escaping gas had easy access to the interior. Seven months previously, a 4-inch drain-pipe had been put in here, crossing underneath the electric conduits, and the gas service-pipe; and the filling-in sank so much that notice had subsequently to be given to the party concerned to make good the paving over the drain. The next event was the explosion, for which the Corporation endeavoured to make the Gas Company liable. The action failed, because the Court held that there had not been contributory negligence on the part of the Company, who were in the right all through. It was the duty of the Corporation, as owners of the electric conduit, to provide against the contingency of an escape of gas in the road where the conduits lay. A recognized means of doing this is ventilation of the conduits, for which, in the present case, there was no provision. More than that, the street conduit boxes had not been opened for almost two months previously to the explosion, and therefore there could not be said to have been a regular inspection for any influx or accumulation of gas. With regard to the subsidence of the drain-pipe trench which caused the escape of gas, that was due to the work not having been properly supervised by the officers of the Corporation who should have looked after it. Consequently the wrong was the Corporation's own, and they could not recover any damages in respect of it from the Company. Judgment was accordingly given for the latter, with costs. There was mention of the possibility of an appeal; but it scarcely seems likely that the matter will be allowed to go further. The law of these gas and electric conduit explosions is perfectly clear, having been defined in regard to Metropolitan cases very early in the history of electric lighting. Those who undertake to make holes in streets where gas-pipes exist must take the consequences. This seems to be the last word on the subject. We are indebted to Mr. Duxbury for a copy of the very clear plan which he prudently made immediately after the accident, and which exhibits convincingly all the material circumstances of the occurrence, and enables one to see at a glance the unfortunate concatenation of drain-trench, conduit, and gas-pipe.

Parliamentary Topics of the Week.

The House of Commons this session appears to have assembled literally for the despatch of business; members generally having exhibited a degree of reasonableness in the use of the opportunities for debate provided by the opening proceedings of the House which contrasts pleasingly with previous experiences. As regards subjects of a public or semi-public nature, there has been some discussion on the law of Trade Unions, the status of the Board of Trade, the industrial enterprises of Municipalities, and the Penrhyn deadlock. The debate upon Trade Union law was futile, because there are now within the cognizance of Parliament a couple of Bills which cover the ground, and therefore, by the rules of the House, the subject-matter of these projects of egislation could not be raised upon a motion. A Government motion to reappoint a Committee to be joined with a Committee of the Lords to consider the question of municipal trading was talked out by Mr. John Burns. Nothing came of the Penrhyn discussion, except that somebody called Lord Penrhyn "stubborn," without appearing to reflect that the same epithet would equally apply to the other side. The second reading of the Gaslight and Coke Company's Acts Amendment Bill is postponed to the evening sitting of to-morrow. The Gaslight and Coke Company's own Bill was put down for second reading yesterday (Monday), when Mr. Lough was to move its rejection. It would be an untoward thing if this motion, which breathes more spite than justice, were to prevail, and leave the Company exposed, without an alternative offer of their own, to the offensive tactics of the London County Council. There is apparently a warm reception awaiting the other legislative proposals of the County Council, to say nothing of the criticism of the manner in which the Council have exercised their peculiar privilege of initiating and opposing Bills in Parliament, which is certain to be heard before the session closes.

At the last moment, it appears that the Parliamentary Committee of the London County Council have awakened to the sense that the various questions of photometry and gas testing with which they have been persuaded to meddle in connection with the Metropolis Gas Bills of the session are beyond their comprehension. They accordingly, with a fine modesty which does them infinite credit, propose to relieve Parliament of the trouble of dealing with these matters, by asking the President of the Board of Trade to pack them all up for reference to a Departmental Committee. This, after dragging the South Metropolitan and the Commercial Gas Companies into action, throwing the same matter at the Gaslight and Coke Company, and changing their own position upon the problem of the proper quality of the gas supply of London! It is midsummer madness. Business of this gravity is not to be played with, like children's toys. If the overgrown irresponsibles of Spring Gardens want amusement, let them play with fireproof building construction, or something equally simple. Now they are forbidden to splash themselves with London water, they ought to be prevented from burning their fingers at London gas. The Committee of the Council are actually good enough to interest themselves in the Crystal Palace District Company's Bill, so far as to suggest that the sulphur clauses of this measure should also be remitted to their new fancy, the Departmental Committee. Since when have the Council had such love for the Board of Trade? It is to be hoped the President of the Board will consult his own dignity by refusing to allow the parliamentary mistakes of the Council to be unloaded upon his premises. The Gas Companies implicated can never consent to this fatuous plan for the submission of a statutory settlement to departmental revision.

The Educational Value of Ignorance.

There is an important—indeed, an essential—part of advanced education which is hardly ever mentioned in polite technical society. It is concerned with the things which are not known, and which cannot be done. In the disciplinary system of the elementary school, it is a fundamental point that nothing must be permitted to diminish the awfulness of the master and the books. No suspicion that either could err, or be lacking in any perfection of skill or knowledge, must be allowed to enter the youthful mind, or there would be an end of the usefulness of the school. This is quite right and proper in the place where long experience has confirmed the wisdom of the rule—that is to say, in school. It is the fact, however, that a very considerable colour of the same pretence is appropriated by science and technics teachers and the authors of text-books, with small justification and unfortunate results. Whatever the subject of the ordinary text-book, it usually pretends to teach all about it; and the consequence is that the ingenuous student who has read up his chosen subject is encouraged to think he knows it thoroughly, whereas the truth is he has no suspicion of how little he does know. Naturally, because the book is careful not to confess the limitations of the author's knowledge. Take any text-book one sees put into the hands of gas engineering students—say a work on the gas-engine—and probably the real defects and drawbacks to the use of the machine are either not pointed out at all, or are so lightly touched upon that the mere student would never suspect their importance. We are tempted to mention this weakness of the text-book order of technical teaching, by the

reports that have come to hand of the terrible mess made in New York by the smoky bituminous coal which had to be bought when the supply of anthracite was lately cut off. It reminds one of the similar experience of London at the time of the Welsh miners' strike, when all the locomotives and factory boilers took to smoking as badly as if nobody had ever attempted to solve the problem of smoke prevention. Yet the treatment of the subject of boiler-firing in the text-books on fuel and steam is apparently exhaustive and informing. Many smoke-preventing appliances are described by these authorities; for the number of improved mechanical boiler-stoking arrangements is legion. Nobody has the candour to state that they are all futile, so far as their main purpose is concerned, and that the only reliable way of preventing smoke is to burn nothing but clean anthracite or coke. Mechanical boiler stoking? Smoke-preventing devices? Certainly—turn to the index of the book, and see how many entries there are under both headings! And to think that there is still not a steamer afloat, big or little, fitted with machine stoking appliances, and that the moment the supply of anthracite and coke is cut off from any city, every one of its boiler fires smokes to Heaven! No engineering student, at any rate, can regard himself as decently well up in any subject until he knows where the weak places are. The cut-and-dried information provided by the text-book and the ordinary teacher, often in the form of question and answer, never supplies this knowledge. He is a bold, as well as a wise, professor of any branch of science, who will say at once that he does not know the right answer to some questions.

A Check to Municipalizers in Paris.

The closing lines of the epitome of the proceedings in the Paris Municipal Council on the subject of the gas supply of the city which appeared in the last number of the "JOURNAL" (p. 563), in which was recorded the fact that the Council had rejected a proposal to municipalize the gas supply of the city at the close of the Company's concession, have a far greater significance than would at first appear. In Paris, as elsewhere, the socialist municipalizer is rampant; and he has had a good deal to say on the gas question. Statistics were procured from far and near in support of municipal control; and it was urged that a system which was found to work satisfactorily in some of the principal cities in England and on the Continent would be the proper thing for Paris. But the Prefect of the Seine was not to be captivated by perfervid oratory. He looked at the proposal with judicial dispassionateness, and scrutinized it in the best interests of the citizens generally, with the result that he pronounced municipalization of the gas supply of Paris to be "impossible"—at any rate, at the present juncture. That word turned the scale; and the Metropolis of France, speaking through what may be regarded as the most level-headed of her representatives in the Municipal Council, has decided to follow the example of Lyons, and more recently of Bordeaux, determined not to adopt a system they deemed it wise to reject. This resolution cleared the ground for the consideration of the various schemes submitted by the Prefect of the Seine as suitable for adoption; and some decision thereon may be looked for shortly.

Movements of the Flame in the Explosion of Gases.—Our readers may remember that the above subject was exhaustively dealt with in a paper read by Mr. Harold B. Dixon, M.A., F.R.S., Professor of Chemistry in the Owens College, Manchester, before the Royal Society in June last year and, by the courtesy of the author, we were able to reproduce it in the "JOURNAL" for the 1st of July. We have now to express our thanks to him for a print of the paper as prepared for the "Transactions" of the Society, accompanied by eleven plates of beautifully executed reproductions of photographs.

Piping of the Boston Water-Works.—At the last meeting of the New England Water-Works Association, Mr. Caleb Mills Saville, Divisional Engineer on the Metropolitan Water-Works, read a paper on "Pipes and Pipe Laying." The author showed that although there are many miles of 48-inch and 60-inch pipe, there are in the lines no gates larger than 36 inches; long reducers being used on each side to give a taper something like that of a Venturi meter. Changes in direction are made by opening joints on straight pipe as far as possible with openings not exceeding 1 inch. When special curves are used, they are backed with concrete to take the thrust, and the joints run solid with lead; the pipes being laid carefully to line and grade, with their axes usually about 5 feet below the surface of the ground.

WATER AFFAIRS.

Preparing for the Great Arbitration.

THE first step in what promises to be one of the most formidable arbitrations ever entered upon in connection with the transfer of water-works from private owners to a public body was taken last week, by the publication, by the three Arbitrators appointed under the Metropolis Water Act, 1902—Sir Edward Fry, Sir Hugh Owen, and Sir John Wolfe Barry—of a notice indicating the lines on which they intend to proceed with their important inquiry. By the terms of the Act, the Arbitrators were to commence their sittings within nine months after the passing of the Bill; but, according to the notice, they will start well within the limit specified. The first sitting will take place on the 29th of May, and to it, as well as to all subsequent sittings, the public will be admitted. The decision to conduct the arbitration with open doors will, we imagine, be received with general satisfaction. A feeling has prevailed in certain quarters, and has also found expression, that the Arbitrators might be inclined to take a rather too liberal view of the worth of the property they have to appraise; and this feeling would very probably gain strength if the proceedings of the Court were conducted *in camerâ*. The sellers have certainly nothing to be ashamed of. They have for years been subjected to more scrutiny by Royal Commissions and Parliamentary Committees than the owners of any other undertakings upon which the public have to depend for the supply of a commodity; and they have passed through the ordeal triumphantly. The works they offer will be worth the price asked for them; and, notwithstanding the attempts now being made to depreciate their value, the social and professional standing of the three Arbitrators is sufficient guarantee that justice will be done to all parties.

A fortnight before the sittings of the Court commence, the Water Companies, the Staines Reservoirs Joint Committee, and the Councils of the urban districts mentioned in the second schedule to the Act, are to deposit with the Secretary of the Court copies of their statements of claim, in the event of their not having previously agreed with the Water Board as to the amount of compensation to be paid to them. Copies of these statements, numbered consecutively in the order of their reception, are to be forwarded to the Board, who, on or before the 17th of August, are to deliver to that official copies of their answer to the first statement, and to the rest at intervals of a week. In these answers they are to specify what compensation they are willing to pay, and add any relevant facts. The delivery of these statements and answers will not prejudice the right of the Companies and Councils and the Board to subsequently agree upon the amount of compensation. On or before the 17th of October, the Board are to send in their statements of claim in respect of the amount to be paid by the Local Authorities of Croydon, Richmond, Cheshunt, and Ware, for their portions of the works excluded from the Board's limits of supply under section 12 of the Act, unless a prior agreement on this matter has been come to between the parties. These answers are to be delivered by Dec. 17.

By the end of the year, therefore, the Arbitrators will be in possession of all the material with which they will have to deal. But it may be assumed that by this time they will have disposed of some, at all events, of the earliest of the claims sent in. In fixing the sum to be paid to the claimants, they are to determine the value of each undertaking "as if, with "the necessary modifications, the law of compensation for "the purposes of the Lands Clauses Acts were applicable to "the case;" but they are not to make any allowance for compulsory sale, or take into account "any enhancement or "depreciation of the market value of any stock or shares" caused by, or resulting from, the passing of the Act, or the anticipation of this event. They may, however, make such allowance as they think just for recoupment of any loss of interest pending re-investment, as well as for the incidental expenses attending the operation. They are, in the words of the Act, "to make, as far as possible, all their awards "before the appointed day," which is June 24, 1904, or such other day thereafter as the Local Government Board may appoint. The first move has been made. The next may be expected to be the announcement of the completion of the constitution of the Water Board.

ESSAYS AND REVIEWS.

THE GAS ENGINEER AND THE TECHNICALLY QUALIFIED GAS DIRECTOR.

It is characteristic of Mr. Charles Meiklejohn that whatever he takes in hand is done conscientiously, and, were it not for what appears hereafter, we could add always well. His highly creditable work at Rugby, and his meritorious labour as the Honorary Secretary of the Midland Association of Gas Managers naturally come to mind as points in proof. In connection with the latter, it was his just reward that he should be placed in the presidential chair, though we doubt if he appreciates the honour to the extent that he does the confidence of the members and the claims of the duty that membership of a body for mutual benefit imposes.

Mr. Meiklejohn inaugurated his year of office on Thursday with an address, which to say the least was, in some respects, unique, and full of life and variety. The new President is a man of deliberate opinion; and he has the courage to declare that opinion, on whatsoever subject it may be, whether he be of the majority or of the minority. Nor has he any antipathy to the criticism of his views; and he recognizes, as the "Journal" has often had to recognize, even at the hand of the President himself, that "censure is a tax a man pays the public for being eminent." The address itself offers an opportunity for illustration. In one part the President announces his conviction that "journalistic technical teaching will never produce the men required [for the gas industry], because of the immensity of its kangaroo-like jumps in opposite directions." As to the first part of this passage, we never had the audacity to expect that it would, and, as to the second part, it is a strongly expressed indictment lacking any specific charge or proof. In such points is found the weakness in places of an (in many respects) otherwise splendid address. It is easy to spin out several paragraphs of generalities; but it is more difficult to put one's finger on a spot, and to make an unchallengeable dogmatic assertion in regard to it. The "dilemmas of a gas engineer" are equally, if not more so, the dilemmas of the journalist. When doctors differ so greatly and strangely, where does the recorder of their views and beliefs come in? Let the President read through the latter part of his address again. Then lift his eyes from the technical gas press, and take a wider range of view—first over the discussions of the technical organizations, and then over the home work of his professional colleagues throughout the kingdom. Does he not see in the proceedings of his own profession anything that resembles the peculiar agility of the famous antipodal quadruped? A technical newspaper must, if it is to be of any service at all to the profession—particularly at the moment in the gas industry when the quest for truth and knowledge is being made in full earnest—be liberal in both purview and survey. When the doctors of the profession agree on all points, then perhaps once more the uniform, heavy pabulum of a long past day will be served up week by week; and then, too, the gas engineering chief of the great scholastic town of the Midlands will rest peacefully, and the gas industry's journalists will have to go on their way stoically bearing the scourge from other quarters.

But the President's address itself (excellent as is the literary style of some of the sections of it) is not irreproachable; and it is necessary in dealing with it to adopt, as he does, the good old-fashioned method of administering the nauseous pill in jam. The address is a remarkable piece of constructive work. It is built up of many parts—some good, others doubtfully so; but there is an absence of cohesive substance between them. In listening to the deliverance, the members were carried from one subject to an altogether remote one with remarkable sprightliness, which also reminds one of the President's already mentioned simile. The address opened with a complaint, and closed with one. From generalities, the President jumped to the capital account, from the capital account to inclined retorts, from these to the past work of the Midland Association, from that to ventilation, from ventilation to cyanogen, and from cyanogen to the results at Rugby, and from Rugby to the question of the qualified gas man as a director. Notwithstanding the diversity of the parts, the address was full of vigour. Praise and kicks were meted out to one and the same object of the President's attentions with glorious freedom. But all the same the address contained much that is of value, and many points that must be considered by the reader with the same measure of seriousness that the President gave to them.

We cannot, however, pass them all in review here; and so will limit further comments to the subject that affects us the nearest. It is that which deals with the question of the qualified gas man as a director. The President writes and speaks on this matter fearlessly; and, to put his position briefly, sets himself rigidly against Sir George Livesey's proposition. But he is assertive rather than argumentative; and he has evidently given judgment without taking a circular view of the question. He adopted in considering it one standpoint; and from that he has not shifted. He regards only the interest of the gas engineer and manager; and denies the proposition all consideration as to whether it has in it the merit of being for the general good of the gas industry. Even from his limited examination, we cannot agree that his deductions are correct, and for reasons which will be briefly discussed presently, after two other matters of a preliminary nature are disposed of. The first one has reference to his entire misinterpretation of a sentence that appeared in the first editorial reference in the "Journal" to this latest of Sir George Livesey's propositions. The sentence in question was more accidental than pertinent in connection with this particular matter; and Mr. Meiklejohn will see that it is so if he reads with care the opening of that article once again. The reference to the suggestive speech of Sir George Livesey only afforded an opportunity for mentioning the point. "A few people," the sentence ran, "in the gas industry have assured us that they are sick of hearing and reading about him [Sir George Livesey] and his doings. No doubt, and for very good reasons; but they are of a very small minority." Those words (it is rather amazing to find Mr. Meiklejohn could not see it) are referable to a time antecedent to Sir George's utterances on this question of the expert gas man as a director; and at the time they were penned the gas industry had not had an opportunity of discussing the new proposition. This being so, the tacit meanings that the President attaches to the words have no foundation.

The second point is that we are afraid the President has put a narrow construction on the signification that Sir George had in mind in the use of the term gas expert. It is plain that it is not his intention to suggest the co-optation of "consulting engineers" only on boards of directors, nor that he intends the provincial gas industry to be dominated from Westminster or any other quarter in which the consulting gas engineer is to be found. By expert, he unquestionably means "trained;" and almost every town in the country can to-day boast its trained gas engineer. But they are not at present of the superior power in the administration of the gas industry, and their training, advice, position, and everything else is dominated by the untrained; and the mischievous effects—unseen at Rugby where the utmost confidence exists between Directors and Engineer, and where just dealings are observed—could be produced (if the task were not an invidious one) with overwhelming variety. There are objections from the point of view of the engineer to the sitting of a trained man on the Board, but those objections are overbalanced by the advantages to be gained. The point for consideration is—limiting ourselves to the discussion of the question from Mr. Meiklejohn's standpoint—will the benefits that would accrue to the gas profession by the adoption of the proposition be greater than the disadvantages to the few? We incline to the belief that they would.

In the first place, would the election of one or two technically trained men lead to the suppression of the individuality of the gas engineer, and the magnifying of the position of the technical gas director? Has it done so in the case of the South Metropolitan Company, the Crystal Palace Gas Company, the Croydon Gas Company, the Tottenham Company, the Brentford, the Margate, the Ipswich, the Harrow, the Barnet, and several others that a little search would enable us to mention? We emphatically say it has not. There might be a few isolated cases where it would; but, generally speaking, the appearance on the boards of gas companies in the country who could sympathize, from personal knowledge of the work, with the gas engineers, and who clearly understood the necessities of the time, would be a happy release from bondage for many a professional gas man to-day. Mr. Meiklejohn spoke of a seven years' nightmare that he once had in the management of a capital-overweighted concern, which ponderous capital was brought about before his appointment by the expenditure of a consulting engineer. Why was the consulting engineer in question allowed to spend that money, and why did Mr. Meiklejohn suffer that seven years' nightmare? The answer is because, when the money was spent, there was no one on the Board of the concern who knew anything of the technical side of the business they were supposed to "manage." Why is it that we hear so many engineers say that they cannot get this and that of their recommendations agreed to? Because capital expenditure is involved, and because the directors do not understand. From this cause, many engineers have been, and are to-day, "cribbed, cabin'd, and confined." They have no one in their own court of appeal who can sympathize with their aspirations on behalf of their undertaking, and no one who can realize the necessity of further outlay. On the contrary, they have many above them who ask for bigger dividends and more profits, but who through ignorance dam the very streams that would bring them along.

Mr. Meiklejohn, too, cannot reconcile Sir George Livesey's proposition with his appeal for the attraction of well-educated youths to the gas industry. We can. Let the President again look round. What inducements have the boards and committees of the majority of our gas undertakings offered in the way of remuneration commensurate with the work of their gas engineers? Who is it that are responsible for the skilled labourers' wages that are offered and paid in many places to gas engineers? The answer is boards and committees who cannot, from lack of knowledge, properly appreciate the relative value of those they employ. Let us not be mistaken in this matter. No sweeping assertion is intended on this point; because there are many towns where the contrary prevails. But are they of the majority or the minority? We refuse denial to the assertion that if gas engineers in active service to-day were taking part in the supreme control of one or more gas undertakings, that this blot on the gas industry would

not long exist. The majority of our gas boards and committees as at present constituted have done nothing to make the gas profession attractive; and in Sir George Livesey's proposition we see the rift in the cloud. We want a good sprinkling of directors throughout the country who can appreciate the position; and such directors are to be found among present-day gas engineers. The betterment and elevation of the gas engineer's position is one of the things that Sir George Livesey has in view; and he himself, a gas engineer from youth up, would be the last to make a proposal that would be derogatory to the profession in which he has made the honoured position that he holds to-day. His care is for the future; and there cannot be any personal advantage to himself.

We are afraid that Mr. Meiklejohn's piece of rhetoric brilliance on this subject is sadly wasted, through looking at the proposition from his comfortable seat at Rugby and not from the seats of many other engineers not so comfortably circumstanced. In making his declamation against this proposition, the President was depreciating the honour of his own class, and attributing to them an incapability, in the event of their ascending to directorial status, to refrain from the exercise of a domineering influence. However, the President has a right to his opinions. Sir George Livesey, too, has a right to those he has formed from the broader view that he is in a position to take. Mr. Charles Hunt and Mr. R. O. Paterson (who do not agree with the President) have also a right to theirs. The engineer who is "cribbed, cabin'd, and confined," and the engineer who is ill-paid for services rendered, have also a right to their opinion as to what they could do and obtain if the influence of a gas man was brought to bear on the decisions of the controlling powers. And our own view is that the gas engineering profession would not suffer by the adoption of the proposition, but, on the contrary, it would be a recognition of the special fitness of the profession to take an active part in the higher administration of the gas industry.

AN IMPORTANT JUDGMENT AS TO "INCOMING TENANTS."

THE decision of the Court of Appeal in the case of the *Gaslight and Coke Company v. Cannon Brewery Company*, which will be found reported in our "Legal Intelligence," is both interesting and important, affecting, as it does, the legal position of other gas undertakings beside that directly concerned, though the case primarily turned upon a section in the Gaslight and Coke Company's Act of 1872 which gives to the Company a power possessed by no other industrial business in the kingdom. We think it will be well, therefore, to show fully the exact bearing of the case, which deals with the question of the rights of gas undertakings in regard to arrears due by the outgoing tenants of premises, so far as the liability or otherwise of the incoming tenants for such arrears is concerned. The judgment, it should be borne in mind, has no bearing upon the rights of gas undertakings in respect to the arrears due to them in cases where, as in *Paterson v. Gaslight and Coke Company* and *Re Smith, ex parte Mason*, there is no actual change in the legal occupation of the premises to which the gas has been supplied.

The Gas-Works Clauses Act of 1847 contains no provision in respect of the undertaker's rights or obligations in regard to a change of occupation of premises where arrears of gas are due; but inasmuch as it likewise contains no clause making the granting of a supply to every occupier requiring it compulsory, it was, so long as that Act remained unmodified, always open to a company to refuse to give a supply to an incoming tenant except upon condition that the arrears were paid. Once such a supply was granted, however, the only ground upon which the Act gave the company the right to discontinue it, so long as the consumer required it, was (section 16) the neglect of the person who was supplied with gas to pay the rent due for the same. The Metropolis Gas Act, 1860, sections 14 to 17, made it obligatory upon the Metropolitan Companies to supply gas to every owner or occupier of premises (within the area of their supply, and within a specified distance from their mains) who should fulfil certain conditions as to entering into a contract and, if required, furnishing security; and by section 11 of the Gas-Works Clauses Act, 1871, this obligation was extended to all gas undertakings coming within the provisions of that Act and the "Parent" Act of 1847. Both the Act of 1860 and that of 1871 contain specific references to the question of the liability of an incoming for the debts of an outgoing tenant, which we will deal with in a moment. The Gaslight and Coke Company's Act of 1872, section 18, modified, so far as that Company are concerned, the operation of these clauses in the General Acts; and this section is the one upon which their action against the Cannon Brewery Company turned.

The following is the wording of the section in point; and by omitting the words which have been put in brackets, and placing the word "gas" before the word "company," the exact wording of section 39 of the Metropolis Gas Act, 1860, is obtained. (Section 39 of the Gas-Works Clauses Act is practically, though not literally, identical with the section down to the first bracket, but does not contain the provision which forms the second half of the clause in the 1860 Act—namely, "but the Company shall . . . on being required by him to do so.")

In case any consumer leave the premises where gas was supplied to him without paying to the Company the rate or meter-rent due from him, the Company shall not require from the next tenant of the premises payment of the arrears so left unpaid, unless the incoming tenant agreed with the defaulting consumer to pay the arrears [or unless the incoming tenant shall continue the trade or business of the outgoing tenant, and shall have paid the owner, lessee, or mortgagee in possession, or to the outgoing tenant of such premises, a consideration for so doing]. But the Company shall, notwithstanding any such arrears, in the absence of collusion between the outgoing and incoming tenant, supply gas to the incoming tenant, as required by this Act, on being required by him to do so.

Both the Metropolis Gas Act, 1860, and the Gas-Works Clauses Act, 1871, therefore, give a gas company the right to "require" the incoming tenant to pay the arrears due by the outgoing one, if he has agreed with the latter to do so. The Gaslight and Coke Company are, in addition, empowered to "require" such payment from the incoming tenant if he has paid a consideration for the right to continue the trade or business of the outgoing tenant. What does that right "to require payment" imply? In the case of the *Gaslight and Coke Company v. Mead* (1876), it was held by the Queen's Bench Division that the words "require payment" in section 18 of the Company's Act of 1872 did not give them the right to sue the incoming tenant for the arrears; Justice Blackburn ruling either that the Company's remedy was to cut off the incoming tenant's supply, or that it was to abstain from supplying him. The reported judgment in that case is not very explicit as to which of these slightly different alternatives was held to be the Company's right; but it was quite definite as to their not being entitled to bring an action for recovering the arrears. Was the Mead case rightly decided? In the event of collusion being proved as between the outgoing and the incoming tenant—as, for example, if a defaulting consumer put forward a confederate to claim a supply as an incoming tenant in order that he, the debtor, might continue to obtain gas without paying the arrears—it is clear that a Metropolitan Company could discontinue the supply. But do the clauses giving them this right prohibit them from discontinuing the supply to an incoming tenant except in the one case of collusion? or are they entitled to do so for his failure to pay arrears in the excepted cases mentioned in the clause previously quoted?

These were the points to be considered by the Court of Appeal in the case now under review, in which the respondents, the Cannon Brewery Company, admitted that they were carrying on the trade of the previous tenant of certain premises supplied by the appellants, the Gaslight and Coke Company, and had paid him a consideration for so doing, but refused to pay the arrears due for gas supplied to that tenant. The Gaslight Company cut off the supply to the premises; and the incomers, the Brewery Company, did not make any application for a supply to themselves. To ascertain whether, as they were advised, the Mead judgment was not good law, the Gaslight Company entered an action against the Cannon Brewery for the recovery of the arrears under their Act of 1868, which (sections 70 and 71) provides that they may summon any person who is liable to them for gas supplied—not, it will be observed, merely any person who has been supplied with gas. The County Court and the King's Bench Division held themselves bound by the Mead case, and consequently gave judgment for the defendants. Against these decisions, the Gaslight and Coke Company appealed; and after such a delay as is only too common in the Appeal Court, the case was heard and judgment given on Friday last.

The Lords Justices, after hearing Counsel for the respondents at considerable length, gave judgment for the Gaslight and Coke Company, overruling the Mead case, and deciding that the Company's only remedy against an incoming tenant who is liable, under section 18 of their Act of 1872, to pay the arrears of the outgoer is, except in the case of collusion, to summon him before a Magistrate under sections 70 and 71 of their Act of 1868. That is to say, the Court of Appeal refused to draw any distinction between the words "require payment of arrears," and "recover the amount of arrears." Counsel for the respondents argued that, if it had been intended that a gas company should be able, under any circumstances, to sue one man for another man's debts, the language of the Acts would have been more explicit, and would have given the Company not merely the right to "require" payment, but also would have expressly given them the power to "recover" the amount of the arrears. But it was pointed out by the learned Judges that, as the concluding paragraph of both section 18 of the Gaslight and Coke Company's Act of 1872 and section 39 of the Metropolis Gas Act, 1860, prevents the Companies governed by those Acts from discontinuing or refusing a supply except on the ground of collusion, they would be deprived of all remedy against an incoming tenant who had agreed with the outgoing to pay the arrears, if they could not sue him; and the Gaslight and Coke Company would be in the same position in respect of an incoming tenant falling within the second exception in their special clause.

This judgment, therefore, makes it perfectly clear that every gas undertaking governed by the Metropolis Gas Act or the Gas-Works Clauses Acts can bring an action against an incoming tenant to recover from him any arrears which he has agreed with the outgoing tenant to pay, but must not cut off his gas supply to enforce such payment. Whether, in the event of collusion being proved, Metropolitan Gas Companies have any right against the incoming tenant except that of cutting off the supply—their right of action being against the outgoing tenant only—is not quite so

clear. But this would appear to be the position, as collusion is not one of the grounds stated for requiring payment from the incomer. As, however, in such a case, there would not probably be any material distinction between the incoming tenant and his predecessor, the right of discontinuing the supply to the premises and suing the original consumer would obtain, doubtless, all the satisfaction the Company could possibly hope to get.

There is, we should imagine, little likelihood of this case being carried by the Cannon Brewery Company any further, in view of the very definite opinions expressed by all three Judges in the Appeal Court, and of the fact that their Counsel made it evident that the question of costs is already rather an unpleasant one for them to contemplate. So that it may now be taken as an established fact that the Gaslight and Coke Company can, if they choose, always recover by legal process from the purchaser of any business carried on within their area of supply, any arrears due in respect of gas supplied to the premises where the business is conducted, whether such purchaser requires to be supplied with gas or not. This is certainly a remarkable power to possess; but the Lords Justices, in the course of Counsel's arguments, expressed it as their opinion—apart from the fact that the Company's Act gave them such power—that it was not an inequitable thing. The value of a business is enhanced, it was remarked, by the supply of such a necessity as gas; and the Gas Company are compelled to grant a supply to any and every occupier who requires it. Therefore they are entitled to special rights in regard to debts accruing; and any purchaser of a business ought, as a matter of common prudence, to make sure, before completing the transaction, that there are no arrears due for gas, in the same way as he should ascertain if the rent and taxes are paid. There is certainly much to be said for such a view; and the judgment will doubtless be of great value to the Gaslight and Coke Company, who alone possess such a power—though there appears no good reason why other companies should not be granted it. But it behoves the various trade journals of the Metropolis to make the judgment and its meaning well known to their readers, so that no one may suffer hardship by being caught unawares.

ELECTRIC LIGHTING MEMORANDA.

The Affairs of the Manchester Electricity Committee—Repetition of an old Corporation Foible—Dr. Kennedy takes his Stand—A Disappointing Trade.

MATTERS are in a disappointing condition in respect to the Electricity supply undertaking of the Manchester Corporation, to judge from what is going on inside the Electricity Committee, who have now resolved to pass on their anxieties to the City Council. The present trouble came to a head last August, when Mr. Metzger, the Chief Electrical Engineer, reported "confidentially" to his Committee on the actual condition and prospective requirements of the plant under his charge. He showed that by the close of the present year it would be necessary to meet a demand for the electricity equivalent of 51,150-horse power, while the plant available would represent 54,600-horse power; thus showing a surplus of 3350-horse power. This allowed for one spare generating unit at each of the three generating stations; and he wanted more. This estimate was challenged by the Deputy-Chairman of the Committee, Councillor Hesketh, who was of opinion that the surplus plant was more nearly 15,000-horse power, and that the stations were already over-engined. The question was very seriously regarded by the Committee, who found themselves faced with a request for more capital expenditure while some of their most influential members thought there was already more than enough plant, and Dr. Kennedy's opinion was asked on the point.

Dr. Kennedy has been for years the superior advisor of the Manchester Corporation on their Electricity Department, and in 1901 he laid down plans, which have been partly carried out for the extensions required to deal with the electrization of the tramways. Dr. Kennedy also received authority to make whatever further arrangements might be necessary to provide for an increased demand, if the event should prove it to have been underestimated. In these circumstances, it appears rather irregular that the question of what was needed last autumn was not addressed to Dr. Kennedy direct; and this consideration naturally occurred to Dr. Kennedy himself, as he declined to deal with Mr. Metzger's report by itself. This refusal struck Mr. Metzger as regrettable; but most people experienced in the conduct of affairs will have no difficulty in supporting the Consulting Engineer's action. It looks very much as if the Manchester Corporation Committee had been trying the old trick of sitting upon two stools, represented by their Consulting and Resident Engineers, and had come to the ground in consequence. Dr. Kennedy was only half consulted, and Mr. Metzger was only half trusted; and the actual situation of the Committee is the result of this unbusiness-like behaviour, which curiously repeats the old vagaries of the Corporation Gas Department. Some of the worst men of business in all Manchester must surely get into the City Council!

So far as the involved story of these consultations and schemings can be understood, it appears that when Dr. Kennedy was instructed to plan the extensions decided upon in 1901, in co-operation with Mr. Metzger, he was not asked to go into the whole question of what was or might be required, but was directed to make a certain provision, which had been decided upon as requisite by the local experts. As he now remarks, this was most unfortunate, as he could just as well have settled the data of the probable demand to his own satisfaction then as now. When the incident of last August cropped up, and local judgments, which the consultant had previously been instructed to accept, exhibited so wide a difference in respect of what more should be done, Dr. Kennedy (rendered more alert to the nature of the case) flatly refused to have anything to say unless he had the whole matter laid before him. The Committee yielded, and the Consulting Engineer, for the first time, reviewed the situation as a whole. He reported accordingly; and it is this report that the Committee have now approved and passed on to the City Council. The gist of the statement can be given very shortly. It is Dr. Kennedy's opinion that there is no immediate need for any large additions of plant, and therefore no such call for further capital outlay, as Mr. Metzger asked for. It was clearly not Mr. Metzger's proper business to deal on his own account with these capital questions, which were patently within Dr. Kennedy's province.

On the other hand, the Resident Engineer's solicitude was inspired by a perfectly legitimate desire to have ample precautions against possible breakdowns, such as the Manchester electricity undertaking has suffered from in the past. But, as Dr. Kennedy, with his wider outlook, truly suggests, rather than states, in his report, it is not possible to make assurance doubly sure, at any reasonable cost. The Resident Engineer seems to have treated emergency as realized, and proposed to have something still in hand; but this is not business. Spare plant must be reckoned upon for use to meet emergencies, which is what it is for. At the bottom of Dr. Kennedy's report, however, there lies the distinct revelation for those who can perceive it, that the volume of trade upon which the Electricity Committee have reckoned has not been forthcoming quite so early as was expected. The richest district for lighting is pretty full up; and fresh consumers from farther afield must be hunted for. Moreover, the outlying tramway business is not exactly booming. In May, 1901, provision was confidently demanded for 757 cars. Even next year, the number in use will not be more than 550. This is where the electrical shoe pinches. Besides, the Corporation have no further use for electric light for the streets, which makes an additional difference to the Electricity Committee. It all amounts to the conclusion which Dr. Kennedy enunciates, that for some years to come the city will have a considerable margin of power for disposal beyond that necessary to supply the normal increase of load in the district supplied. It is the case of Salford over again. Meanwhile, the most urgent need of Manchester is not additional plant, but more business; and Dr. Kennedy plainly tells the Committee and their Engineer that the best object to which they can for the present apply their energies is the stimulation of the public demand for current, especially in the outlying districts into which the mains now extend. All internal squabbling must cease, and everybody must attend to the shop. The Committee already think of reducing the price of power current to 1¼d. per unit for full weekly demands. They all go for this remedy! When will gas manufacturers have the boldness to make the counter-move, and offer power gas at half the lighting price?

The Southern District Association of Gas Engineers and Managers will hold their annual meeting at the Hotel Cecil on Thursday, the 19th inst., when the President (Mr. J. Tysoe) will deliver his Inaugural Address. Beyond the formal business, the only other item on the *agenda* is the report of the Naphthalene Investigation Committee. The annual dinner of the Association will take place at the conclusion of the meeting.

Light and Economy in the Church.—The Rector of Clapham and his churchwardens (says a local paper) are to be congratulated upon their economizing little scheme for the better lighting of the Parish Church. Throughout the building the ordinary gas-jets have been replaced by incandescent burners; and it is interesting to note, on Sunday evenings, that there is a brighter, cheerier glow about the interior of our historic but sombre old Parish Church, in spite of the fact that something like only 42 of these new lights have been substituted for 173 of the ordinary lights, while in the matter of gas consumption, it is equally satisfactory to find that for an hour-and-a-half under the new *régime* only 165 feet are burned as against 900 feet previously.

Photography and Incandescent Gas-Light.—At a recent meeting of the Royal Microscopical Society, Dr. A. W. Rowe, F.G.S., gave an interesting lantern demonstration, showing the minute structure of various fossils from the chalk. These had first been cleaned from the matrix in which they were embedded by brushes worked by the dental engine, and were then photographed in the ordinary way under low powers—the highest lens used having a focus of 1½ in. As many of the objects were irregular in surface, it was necessary to use strong contrasts of light and shade; and though many illuminants were experimented with, Dr. Rowe found incandescent gas to give the best all-round results. The process, he said, had its limitations; but it was applicable to most of the smaller fossils from the chalk. All the photographs stood out with the distinctness of a stereoscopic picture.

ACCOUNTS OF THE METROPOLITAN GAS COMPANIES FOR THE YEAR 1902.

—	Chartered.	Commercial.	South Metropolitan.	All the Companies.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Capital and borrowed money (including premium capital)	27,553,847 11 9(a)	1,154,457 13 6	7,780,000 0 0(a)	36,488,305 5 3
Income—viz.:				
Sale of gas by meter	2,975,569 5 2	344,059 17 6	1,227,842 1 3	4,547,471 3 11
Public lighting, including lighting under contracts	152,562 3 1	17,095 3 9	58,306 12 9	227,963 19 7
Rental of meters and stoves	55,768 1 11*	20,290 11 10	90,520 15 8	166,579 9 5
Residual products	794,982 14 9	93,612 6 5	487,543 9 5	1,376,138 10 7
Miscellaneous, including old materials	19,975 17 9	1,334 8 9	9,134 13 8	30,445 0 2
Total income from all sources	3,998,858 2 8	476,392 8 3	1,873,347 12 9	6,348,598 3 8
Expenditure—viz.:				
Coal and oil, including carriage and dues	1,406,002 18 4	178,007 11 11	717,066 11 4	2,301,077 1 7
Purifying materials, including labour	100,756 15 3	15,589 3 11	41,530 19 7	157,876 18 9
Salaries and wages—manufacture	330,279 7 1	41,579 12 11	144,546 7 8	516,405 7 8
Wear and tear—manufacture	374,614 18 10	41,790 13 1	196,986 19 4	613,392 11 3
Rents, rates, and taxes	290,695 14 9	17,990 12 1	72,708 11 0	381,394 17 10
Salaries—management	23,086 8 11	2,764 7 4	5,564 15 10	31,415 12 1
Collectors' salaries and commission	43,546 16 4	4,463 6 9	20,622 15 1	68,632 18 2
Stationery, printing, and general charges	20,967 16 5	3,190 3 6	20,486 13 4	44,644 13 3
Directors and auditors	5,935 14 0	2,650 0 0	3,918 5 5	12,503 19 5
Salaries and wages, wear and tear—distribution	180,814 11 4	15,385 3 1	112,790 2 3	308,989 16 8
Repair and renewal of meters and stoves, &c.	134,428 8 5	15,460 18 8	81,849 3 2	231,738 10 3
Law and parliamentary charges	3,720 19 6	2,317 4 3	6,361 9 1	12,399 12 10
Bad debts and extraordinary expenses	53,466 13 8†	13,496 14 1‡	53,172 4 3§	120,135 12 0
Total expenditure on revenue account	2,968,317 2 10	354,685 11 7	1,477,604 17 4	4,800,607 11 9
Gross profit	1,030,540 19 10	121,706 16 8	395,742 15 5	1,547,990 11 11
Do. per cent. on capital and borrowed money	3 14 9	10 10 10	5 1 9	4 4 10
Do. do. gas-rental	32 18 10	33 13 11	30 15 5	32 8 4

(a) Converted. * Stoves only. † Including annuities, £31,361, £2719 on workmen's compensation account, and £5000 stamp duty on increase of nominal capital. ‡ Including £4670 paid under the profit-sharing scheme. § Including £10,672 paid to pension, &c., funds, and £37,660 paid under the profit-sharing scheme.

TABLE *showing the Capital, Income, Expenditure, and Profit, per Ton of Coal Carbonized (including Oil), in* 1902.

—	Chartered.	Commercial.	South Metropolitan.	All the Companies.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Capital and borrowed money	13 8 2·78	4 11 3·04	6 13 11·48	10 10 4·36
Income—viz.:				
Total gas-rental	1 10 5·42	1 8 6·57	1 2 1·74	1 7 6·38
Rental of meters and stoves	6·52	1 7·25	1 6·70	11·52
Residual products	7 8·87	7 4·79	8 4·73	7 11·20
Miscellaneous, including old materials	2·33	1·26	1·89	2·11
Total income from all sources	1 18 11 14	1 17 7·87	1 12 3·06	1 16 7·21
Expenditure—viz.:				
Coal and oil, including carriage and dues	13 8·25	14 0·85	12 4·16	13 3·19
Purifying materials, including labour	11·77	1 2·79	8·58	10·92
Salaries and wages—manufacture	3 2·58	3 3·44	2 5 87	2 11·73
Wear and tear—manufacture	3 7·76	3 3·62	3 4·70	3 6·44
Rents, rates, and taxes	2 9·96	1 5·07	1 3·02	2 2·39
Salaries—management	2·70	2·62	1·15	2·17
Collectors' salaries and commission	5·09	4·23	4·26	4·75
Stationery, printing, and general charges	2·45	3·03	4·23	3·09
Directors and auditors	0·69	2·52	0·81	0·86
Salaries and wages, wear and tear—distribution	1 9·12	1 2·59	1 11·31	1 9·38
Repair and renewal of meters and stoves, &c.	1 3·70	1 2·67	1 4·91	1 4·03
Law and parliamentary charges	0·43	2·20	1·31	0·86
Bad debts and extraordinary expenses	6·25	1 0·80	10·99	8·31
Total expenditure on revenue account	1 8 10·75	1 8 0·43	1 5 5·30	1 7 8·12
Gross profit	10 0·39	9 7·44	6 9·76	8 11·09

TABLE *showing the Increase or Decrease in each Item during* 1902 *compared with* 1901.

—	Chartered.		Commercial.		South Metropolitan.		All the Companies.	
	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.
	£	£	£	£	£	£	£	£
Capital and borrowed money	..	..	26,705	..	302,035	..	328,740	..
Income—viz.:								
Sale of gas by meter	..	394,625	..	11,848	..	63,240	..	469,713
Public lighting, including lighting under contracts	..	12,152	..	2,006	..	825	..	14,983
Rental of meters and stoves	3,301	..	2,376	..	7,550	..	13,227	..
Residual products	..	162,805	..	483	..	76,129	..	239,417
Miscellaneous, including old materials	..	1,555	90	..	..	238	..	1,702
Total income from all sources	..	567,836	..	11,871	..	132,882	..	712,588
Expenditure—viz.:								
Coal and oil, including carriage and dues	..	581,237	..	49,938	..	172,568	..	803,743
Purifying materials, including labour	..	4,761	..	552	..	1,024	..	6,337
Salaries and wages—manufacture	..	43,242	..	3,040	..	7,628	..	53,910
Wear and tear—manufacture	..	79,326	1,734	..	..	26,240	..	103,832
Rents, rates, and taxes	4,727	..	..	185	7,427	..	11,969	..
Salaries—management	260	..	357	..	182	..	799	..
Collectors' salaries and commission	698	..	201	..	1,127	..	2,026	..
Stationery, printing, and general charges	327	..	459	..	943	..	1,729	..
Directors and auditors	..	10	..	..	103	..	93	..
Salaries and wages, wear and tear—distribution	6,964	..	1,788	..	5,197	..	13,949	..
Repair and renewal of meters and stoves, &c.	5,562	..	2,718	..	14,306	..	22,586	..
Law and parliamentary charges	..	670	1,562	..	..	34	858	..
Bad debts and extraordinary expenses	5,192	..	6,902	..	26,836	..	38,930	..
Total expenditure on revenue account	..	685,516	..	37,994	..	151,373	..	874,883
Gross profit	117,680	..	26,123	..	18,491	..	162,295	..

THE GRANTON WORKS OF THE EDINBURGH AND LEITH GAS COMMISSIONERS.

DESCRIPTION PREPARED

BY

WALTER RALPH HERRING, M.INST.C.E., *Engineer.* *

ARTICLE IX., accompanied by Plate No. II, showing Details of the Regenerative Furnaces and Settings of the 1000 Tons per Day Inclined-Retort Carbonizing Plant.

CARBONIZING PLANT—REGENERATIVE FURNACES AND SETTINGS.

The retort-settings are exhibited upon Plate No. II. These were constructed on lines exactly similar to the two that had been erected at the New Street works for experimental purposes. They were designed with the aid of the experience I had gained in the North of England with inclined retort installations, and adapted to the requirements of the different characteristics of the coal which had to be handled in Scotland.

The necessity for dividing an inclined retort-setting into two distinct compartments—an upper and a lower half lengthwise with the retort—has long been recognised as an absolute necessity (although strange to say it is not unusual to find the principle only partly applied); for while the setting has been most carefully divided between the upper and the lower half, the method of conducting the producer gas to the setting has been a conduit common to both halves, with the result that unequal distribution of the fuel gas has been the inevitable result. Each of the distinct halves of the settings is, further—in consequence of the waste gas and secondary air chambers on either side—again divided into two halves. The setting, therefore, becomes four distinct compartments; and I strongly recommend that the partition above the centre middle retort should absolutely divide the setting, so that either half should be under the complete control of its respective damper. I have found it advantageous to lay a false top, consisting of flat tiles, above the setting of retorts and beneath the arch. This not only preserves an equal flue-area through the setting, but it also protects the arch, and results in a non-conducting chamber existing between the settings and the top of the bench. By means of the four dampers, it is quite easy to regulate to the nicest degree the flow of heat through each part of the setting.

The method of taking the gas from the producer is also worthy of some consideration. Many failures have arisen in consequence of the neglect and carelessness on the part of the operatives in leaving the producer charging door partially open. The excess of air so introduced causes intense combustion in the producer itself immediately beneath what may be said to be the weakest part of the setting. As a result, it has been no uncommon thing to hear of the bottom middle retorts being burnt out, or the combustion chambers giving way—sometimes in the very early stages of the existence of the settings. To avoid this, in the "Edinburgh" settings, the construction of the producer is such as to maintain the gas-outlet port from the producer sealed beneath the fuel-bed. The ingress of air through the producer charging-door opening therefore, merely results in generating more gas, with its consequent waste of fuel, but without any serious detriment to the setting as a structure.

A great depth of fuel bed is not a necessity for the proper production of producer gas under nominal flue-draught. A minimum depth of 24 inches with ordinary North of England gas coke is ample to ensure the thorough conversion of the carbonic acid gas, resulting from the primary combustion at the base of the fire, into carbon monoxide gas in its passage through the incandescent fuel-bed. This form of producer has not been commonly used in this country, although some of the Continental settings exhibit this characteristic.

In securing a patent for the principle of a sealed outlet port in the gas producer, the American patent officers cited a very large number of Continental, British, and American patent specifications against the application; but in no single instance were any of the patentees claiming the principle involved, although some of the producers illustrated possess the characteristic of a sealed outlet gas-port. It, however, only appears to have been an accident or an incident of construction, and not a deliberately devised means for securing the production of a gas of uniform quality throughout. There are important advantages in the application of such a principle. The neglect to close the producer charging door does not seriously affect the working of the setting; the slight ingress of air merely acting as an additional primary-air supply. The charging of tarry matter or partly carbonized coal into the producer—as will sometimes happen when first getting to work—does not interfere with the quality of the gas flowing from the producer to the setting, as in its descent through the incandescent fuel-bed it is converted into combustible gas. In the case of using cold coke—which, however, at the present day with coke-conveyors is a thing of the past—the steam and moisture arising from the same are merely broken up and converted into fuel gas before passing away to the settings.

Plate No. II illustrates the details of the "Edinburgh" producers; figs. 1, 2, and 3 being a sectional elevation through the producer, a front elevation, and a sectional plan, respectively.

The quality of the coke used in Scotland is so much inferior to the English coke that a producer of extensive fire-bar area is an absolute necessity. The grate is 3 ft. wide by 4 ft. 4 in. long at the base, with an effective area of 13 square feet. Notwithstanding this large surface, it is found necessary to clinker the producer thoroughly every eight hours. The bearer bars are 3 inches square, and bedded in the solid work on either side. The grate bars are 1½ inches square, and fourteen in number, placed in the breadth of the grate. The supplementary bearer-bar for supporting the temporary bars inserted into the fire during the clinkering operations is also shown. The position of this, when in position, in relation to the fire-bars is worthy of note. It often happens that this bearer is so placed as to make the ordinary clinkering—apart from the thorough cleaning out—a most difficult operation; not only impeding the work itself, but making the removal of large clinker impossible, owing to the bearer constricting the aperture between itself and the ordinary fire-bar bearers.

The arrangements for the distribution of water over the fire-bars are of the ordinary type. The water supply is regulated by an ordinary water-tap discharging into a cast-iron funnel; the flow being visible from the clinkering-floor level. The water-pan beneath the producer is built of hard brick set in cement mortar; the bottom of the pan sloping outwards and leading into a 2-inch wrought-iron pipe, projecting through to the front, the outer end of which is provided with a screw cap or plug so that the water in the ash-pan can be run off before serious clinkering operations are undertaken. This is a precaution which has proved to be necessary in more cases than one; serious accidents—through burning and scalding, and sometimes resulting in loss of life to the operatives in front of the furnace—having occurred, owing to the fire dropping into the ash-pan, and causing an outburst of flame and steam, resulting from the rapid production of water gas.

The large grate-bar area of the producer necessitated large furnace doors and frames. Since I have used the larger frames, I have often wondered why one so often sees such small furnace-doors at the base of gas-works producers. Sometimes two distinct doors are introduced—one for removing the ashes from beneath the fire, and another for pricking and clinkering the fire. The size of the opening of the 'Edinburgh" producer doors is 3 ft. 5 in. wide by 2 ft. 3 in. deep; in fact, the doorway is slightly wider than the breadth of the producer. This gives ample and easy access to the base of the fire, and facilitates the thorough cleaning of the producer and the rapid removal of ashes and clinker from the pans. The frame [Photograph No. 43, p. 618] is fitted with double doors machine-faced, and secured by a cross-bar; one door being fitted with an adjustable slide for regulating the primary air supply to the producer. The idea of introducing the primary air into one or two channels at the base of the regenerator, before giving it access to the producer, considerably weakens the structure of the producer at this point, and more particularly with regard to the support for the bearer-bars, as the cavity of necessity must be above the water-line, and is consequently on the same horizontal line as the ends of the bearer-bars. The stress to which the bearer-bars are put during the process of cutting out and removing heavy clinker from the producer, often loosens these bars when their ends are unstayed or projecting partially into an air cavity. A fatal accident resulting from such a cause induced me to abandon such a practice; the slight recovery of heat under such conditions being of little value when we bear in mind the fact that we endeavour by means of wet steam to keep the base of the fire cool. The furnace-frame is stiffened by means of a 4 inch by 1 inch flat bar, bolted to the upper and lower flanges of the frame, and extended at the outer ends, where it is secured to two 5 in. by 5 in. by ¾ in. angle-steel bent stiffeners forming the corners of the projection of the producer brickwork as will be seen on Plate No. II, figs. 2 and 3, and on Photograph No. 44.

The producer fronts—Plate No. II, fig. 1—are made to project, at the drawing-stage level, 3 feet beyond the front wall of the settings, receding at an angle to a distance of 1 ft. 1½ in. beyond the common face at a point about 4 feet above the clinkering-floor level. This was arranged to enable the producer charging-door to be placed on the horizontal line, to allow of the easy charging of the producer as well as the breaking-down of the coarse clinker by means of bars from the drawing-stage level. With settings of nines it is also much more convenient to have it so; in fact, it is by far the best possible position under all circumstances—excepting, however, that in future work I would be disposed to reduce this projection to 2 feet instead of 3 feet, for

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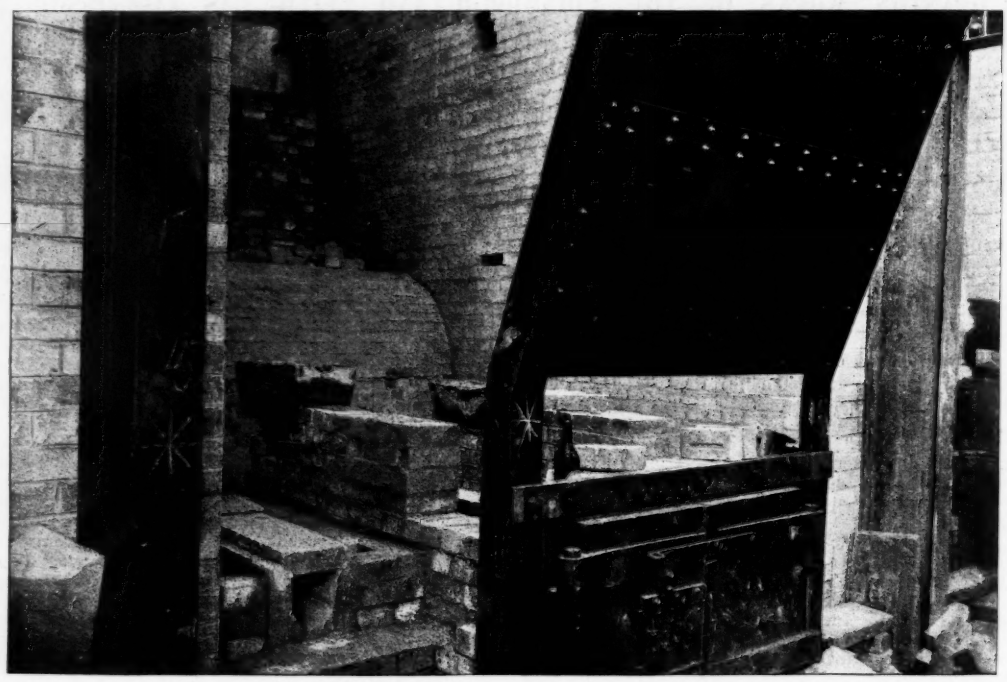
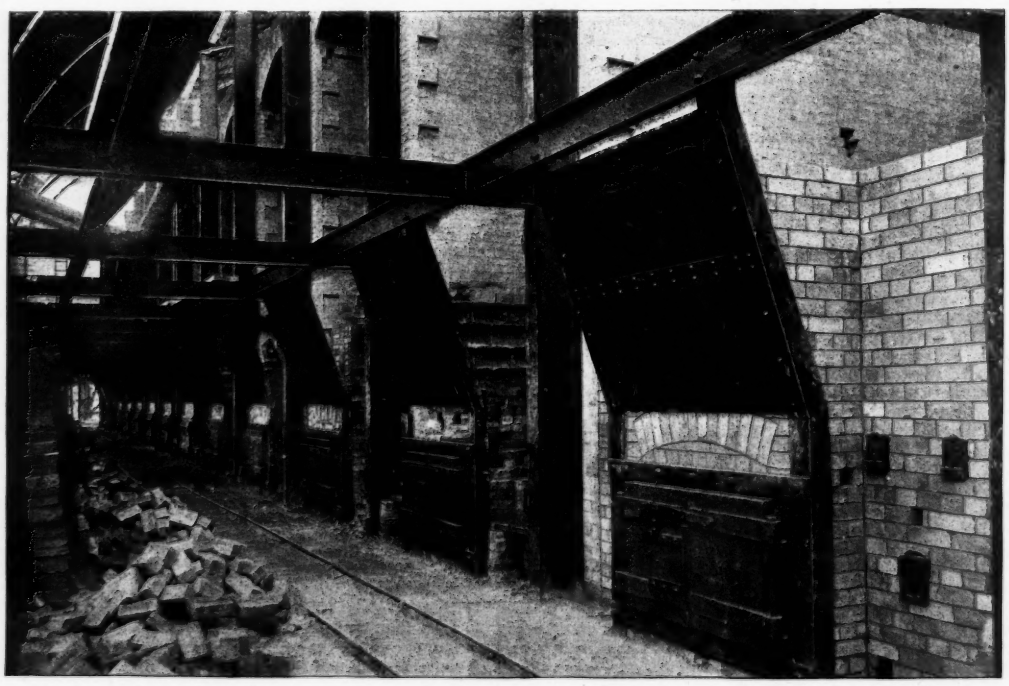


PHOTOGRAPH No. 43 —Illustrating the producer clinkering doors attached to the steel front bracing.

reasons which will be subsequently given. The projection of the producer body beyond the general face-work has other advantages. It acts as a strut or buttress to the front work of the regenerative chambers. The projecting work is stiffened [see Photograph No. 44] by means of 5 in. by 5 in. by $\frac{3}{4}$ in. bent angle-steels; the lower ends being secured within the concrete foundations, and the upper ends abutting upon, and secured to, a 10 in. by $3\frac{1}{2}$ in. by $\frac{1}{2}$ in. channel-steel, which also forms one of the floor-joists of the drawing-stage. The sloping portion of the producer front is supported by a $\frac{5}{16}$-inch steel plate resting and riveted within the two angle steel stays. This plate is not an absolute necessity. As, however, its entire cost for each producer is represented by 3 cwt. of plate, I am of opinion that the advantages of its support, and the facilities it affords for relining the producer, are well worth the expenditure incurred. The damper and secondary-air ports are arranged on either side of the projecting portion of the producer (fig. 2); the dampers being placed immediately within the apertures, so as to permit of easy and accurate regulation from time to time.

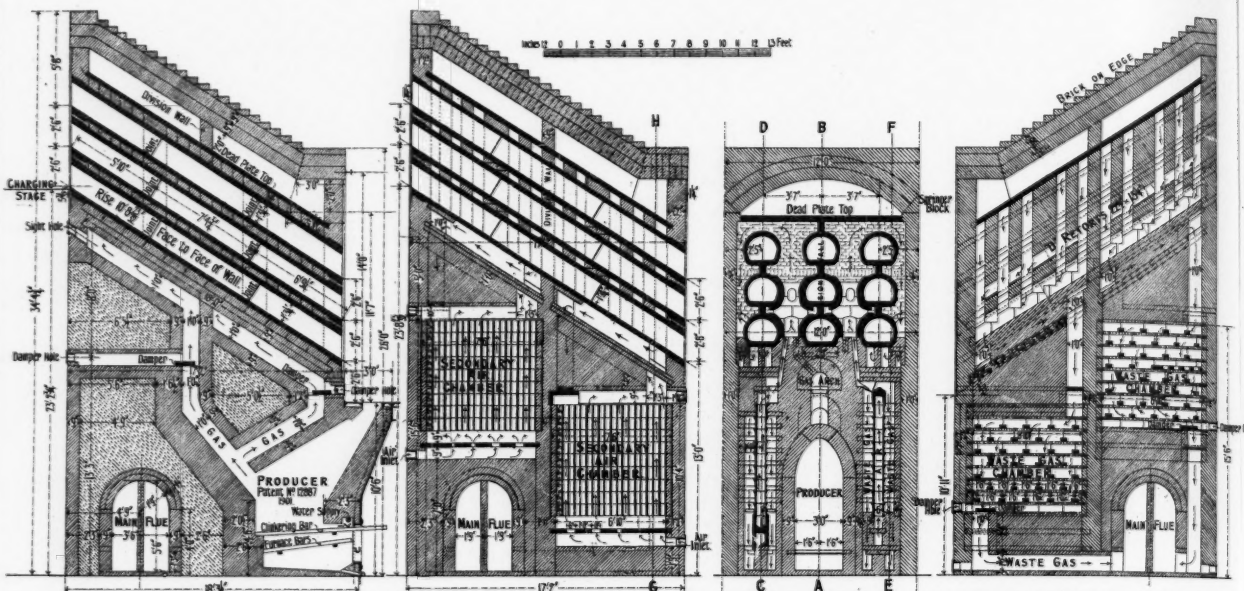
The formation of the front of the producer at the floor-line will be seen on reference to Plate No. 11, fig. 3. The total breadth of the projection is 5 ft. 4 in.; and on either side the work is set back flush with the front wall of the settings from the base to the top. The gas outlet from the producer is shown in fig. 1 with two conduits leading respectively to the upper and lower halves of the settings. Each conduit is governed by a damper or gas-regulating valve; the front one being actuated from the drawing stage and the back one from under the charging-stage. These dampers must be moved at regular periods of (say) one week; otherwise, they become clogged and immovable. They should also be closed on all occasions when a thorough cleaning of the producer is undertaken. As this operation is necessary once a week, it is found that the movement of the dampers for this purpose is sufficient to keep them free and clean. During the time occupied in the thorough cleaning of the producer, the carbonizing operation depends upon the reserve of heat in the settings; and the closing of the dampers prevents a large volume of cold air being drawn through the settings at the time when no heat is coming



PHOTOGRAPH No. 44.—Illustrating the general arrangement of the producer bracing attached to the stage joisting.

The Granton Works of the Edinburgh

The 1000 Tons per Day Inclined Retort Carbonizing Plant



TRANSVERSE SECTION THROUGH PRODUCER ON LINE AB.
FIG. 4.

TRANSVERSE SECTION THROUGH AIR CHAMBERS ON LINE CD.
FIG. 5.

LONGITUDINAL SECTION GH AT DRAWING SIDE OF BENCH.
FIG. 6.

TRANSVERSE SECTION THROUGH WASTE GAS CHAMBERS ON LINE EF.
FIG. 7.

PATENT Nos (British)
12887 — 1901.
15397 — 1901.

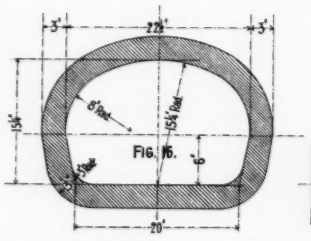


FIG. 16.

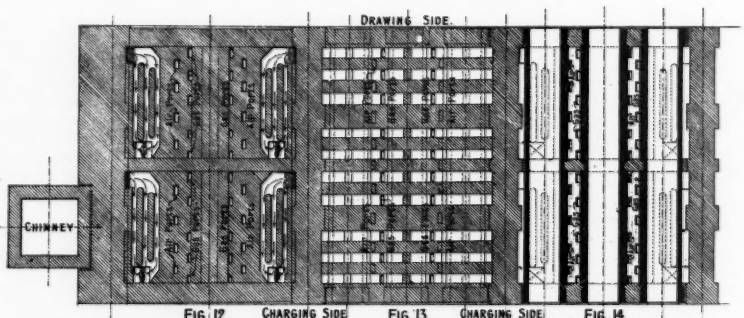
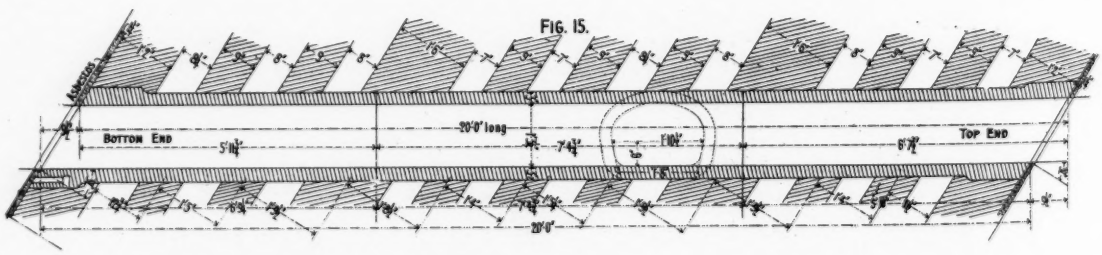


FIG. 12. PLAN SHEWING GAS & AIR PORTS & GAS CHANNELS UNDER SIDE BOTTOM RETORTS.

FIG. 13. CHARGING SIDE. SECTIONAL PLAN ABOVE TOP RETORTS SHEWING DIVISION WALLS WITH GAS PORTS BETWEEN & AIR PORTS BENEATH DIVISION WALL BLOCKS.

FIG. 14. CHARGING SIDE. SECTIONAL PLAN ON BOTTON LINE OF RETORTS SHEWING GAS AND AIR CHAMBERS.

FIG. 15.



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nburgh and Leith Gas Commissioners.

zing Plant.—Details of Regenerative Furnaces and Settings.

No. 11.

TRANSVERSE SECTION THROUGH PRODUCER ON LINE JK.

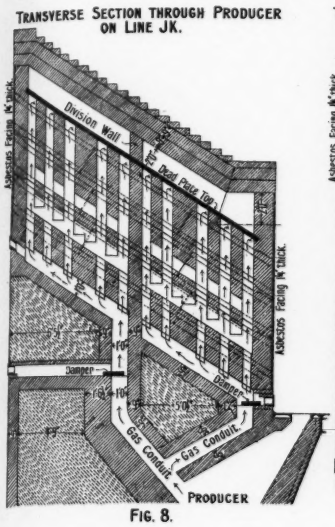


FIG. 8.

TRANSVERSE SECTION THROUGH AIR CHAMBERS ON LINE LM.

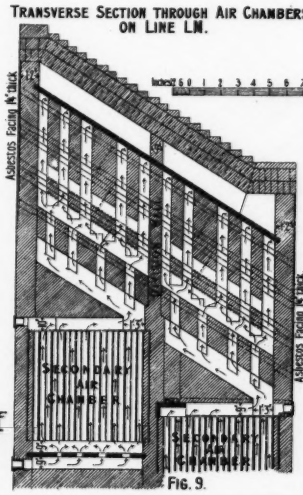


FIG. 9.

PART LONGITUDINAL SECTION GH AT DRAWING SIDE OF BENCH.

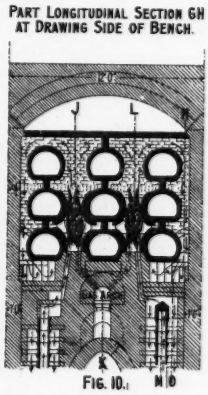


FIG. 10.

PART TRANSVERSE SECTION ON LINE NO.

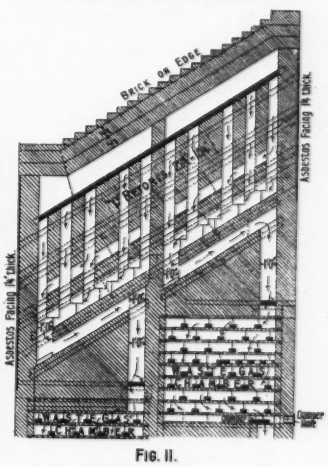
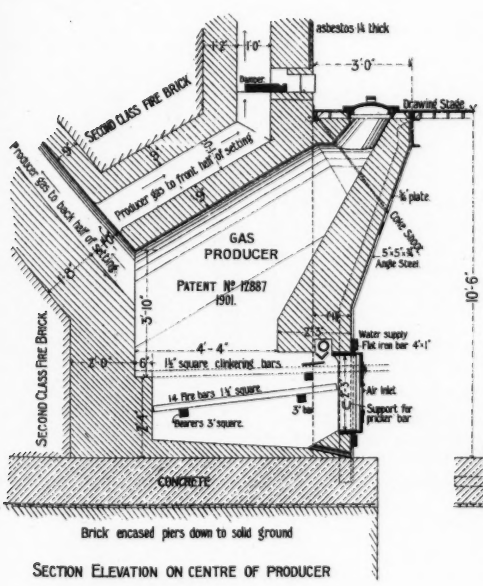
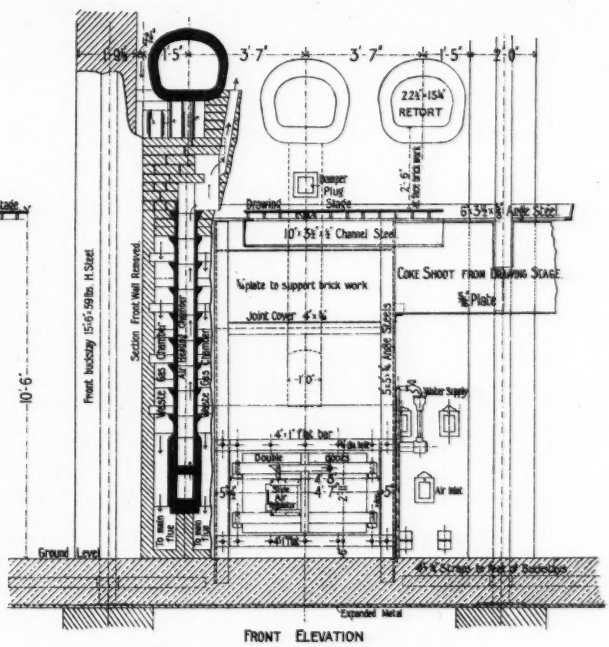


FIG. 11.



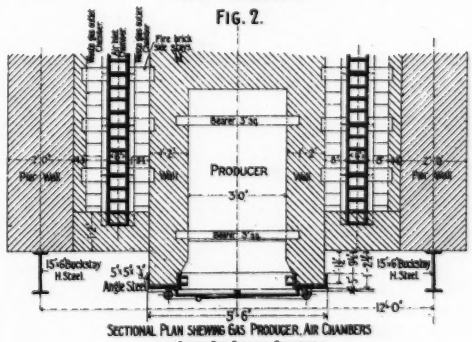
SECTION ELEVATION ON CENTRE OF PRODUCER

FIG. 1.



FRONT ELEVATION

FIG. 2.



SECTIONAL PLAN SHEWING GAS PRODUCER, AIR CHAMBERS AND SPENT GAS OUTLET CHAMBERS.

FIG. 3.

WALTER RALPH HERRING,

M.INST.C.E., *ENGINEER.*

from the producers. These, and all dampers and air ports, should be kept entirely under the control of one man, as their indiscriminate moving is apt to end in disaster.

So many, if not in fact all, failures in the inclined retort system are directly attributable to defective heating arising from defective work or a want of a proper appreciation of the altered conditions of heating a setting of retorts reared at an angle, as compared with one set upon the horizontal line, that no excuse is necessary for dealing somewhat elaborately with the question of producers and regenerative chambers. Having been so closely associated with the development of the inclined retort system, I am perhaps warranted in stating what little I know for the benefit of those who are about to introduce the system; and while I am conscious that the whole of my work has not been exactly ideal in the first instance, I have always realized that the defects were mechanical or structural, and not inherent to the system itself. I cannot even admit the contention that some classes of coal are unsuitable for this method of carbonizing for the simple reason that the very coals that have been named to me as unsuitable are, to my knowledge, being successfully used in other works; and as for the other objections—wear and tear, lower yield, poorer quality, &c.—these all arise from sources common to both the horizontal and the inclined retort systems. My own experience proves that the wear and tear in the interior of the retorts is considerably ess; externally it cannot be greater.

My two experimental settings erected at the New Street works have now been in use for 740 days and 825 days respectively during four and five different seasons. Their condition at the present time—after the most ordinary repairs have been carried out will make them equal to new work.

It is intended to take (by flashlight) photographs of the centre bottom middle retorts in each of these settings, to illustrate the condition they are now in, after carbonizing nearly 1400 tons of coal per retort. These will be published in the course of a few weeks.

The following statement gives pretty concisely the history of these settings during their working life up to date, covering various periods during which they have been carbonizing coal on a practical scale of working.

STATEMENT *showing the Dates and Times during which the Inclined Retort Settings at the New Street Works were under Fire and Producing Gas.*

No. 1 OVEN.

			Off Work.	Time of Working. Months.	Days.
First lighting,	Oct. 2, 1899	..	Feb. 14, 1900	4	12
Second ,,	May 16, 1900	..	July 5, 1900	1	19
Third ,,	Oct. 17, 1900	..	April 18, 1901	6	—
Fourth ,,	June 21, 1901	..	Jan. 25, 1902	7	4
Fifth ,,	June 10, 1302	..	Still working.	—	—

No. 2 OVEN,

First lighting,	May 16, 1900	..	Sept. 10, 1900	3	24
Second ,,	Oct. 17, 1900	..	April 3, 1901	5	16
Third ,,	June 21, 1901	..	Jan. 24, 1902	7	3
Fourth ,,	June 12, 1902	..	Still working	—	—

Total days working—No. 1 oven, 825; No. 2 oven, 740.

STATEMENT *showing the Fuel Used per* 100 *lbs. of Coal Carbonized in No.* 1 *and No.* 2 *Ovens of the Inclined Retort Settings at the New Street Works.*

No. 1 OVEN.

Average for four weeks ending October, 1900 . . . . 14·73 lbs.
,, ,, ,, December, 1902 . . . 16·10 ,,

No. 2 OVEN.

Average for four weeks ending October, 1900 . . . . 13·19 lbs.
,, ,, ,, December, 1902 . . . 14·62 ,,

The total quantity of coal carbonized in both ovens over the whole period, 24,150 tons; coal carbonized per retort, 1336 tons. Retorts still working and in a sound state of repair.

FROM EARLY VOLUMES OF THE "JOURNAL."

March 10, 1849.

For the moment our project for the formation of a United Metropolitan Gas Company is eclipsed by the exciting contest going on between the old Companies lighting the City of London with gas and the projected Great Central Consumers' Gas Company, the Bill for which has been read a second time in the Commons, and goes into Committee on Tuesday, the 13th inst. A reporter will attend on our behalf; and we hope in our next number to give a verbatim report of the evidence produced on this important inquiry, upon which hangs the fate of almost every gas-works in the Empire. A petition from consumers in its favour, signed, it is asserted, by 4900 persons, has been presented, which is easily accounted for when we consider how much may be done by "enormous lying," operating on the ignorance of the London public in relation to such matters, and more especially when we find a paper, calling itself respectable, like the "Morning Advertiser," devoting a whole column of its issue of the 5th to an article abusive of the existing Gas Companies, founded on the following calculation, which they present to their credulous readers as the product and profit realized by gas companies upon every ton of coal used in a gas-works.

	£	s.	d.
8000 to 9000 feet of gas at 4s.	1	12	0
12 cwt. of coke, estimated		8	0
75 lbs. of tar	1	8	0
118 gallons ! ! of ammonia			4¾
Essential oil of naphtha	0	0	0
Pitch	0	0	0
	3	8	4¾
Deduct cost of coal		16	0
Profit on 1 ton	£2	12	4¾

They go further, and state: "At 6s. per 1000 feet, the profit by gas, coke, tar, and ammonia is £3 8s. 4¾d., besides what may be obtained by the naphtha," and then, of course, call the gas companies all the hard names they can think of.

The omission of the Editor of the "Morning Advertiser" to correct a statement which appears in that paper of the 8th inst., asserting that "gas is sold at Croydon at 2s. 6d. per 1000 feet, expenses included," compels us to insert the following extract from the scale of charges of the only Gas Company at Croydon.

CROYDON COMMERCIAL GAS AND COKE COMPANY.—The Company now submit the following reduced scale of charges. By meter, 7s. per 1000 cubic feet. By time, as follows:—

FOR SIX DAYS' BURNING. Twelve-Hole Argand or Batswing Burners.							FOR SEVEN DAYS' BURNING. Twelve-Hole Argand or Batswing Burners.						
Time of Burning.	Per Annum.			Winter Quarter.		Summer Quarter.	Time of Burning.	Per Annum.			Winter Quarter.		Summer Quarter.
From Sunset to	£	s.	d.	£	s.	d.	From Sunset to	£	s.	d.	£	s.	d.
9 o'clock	2	2	0		14	6	6	6	9 o'clock	2	8	0		16	0		8	0
10 ,,	2	12	0		18	6	7	6	10 ,,	3	0	0	1	1	0		9	0
11 ,,	3	0	0	1	0	0	10	0	11 ,,	3	10	0	1	3	0		12	0
12 ,,	3	8	0	1	2	0	12	0	12 ,,	4	0	0	1	6	0		14	0

One hour extra allowed on Saturday nights.

The Company supply meters upon a moderate rental, which are to remain the property of the Company, and to be paid for by the renter if injured or removed, and not to be unconnected without permission having been first obtained from the Company.

The rent will be for a 2-light meter, 4s. per year
,, ,, ,, 3-light ,, 5s. ,,
,, ,, ,, 5-light ,, 7s. ,,
,, ,, ,, 10-light ,, 8s. ,,

J. & W. DRUMMOND
H. RICHARDS } Joint Secretaries.

The Scott Sulphate-Making Plant at Hamilton.—Some of our readers may remember that, in the course of his Inaugural Address to the North British Association in 1900, Mr. W. Ewing, who was then at Hamilton, gave a description of the sulphate plant which had been put up at the gas-works there, on his recommendation, by Messrs. Ernest Scott and Co., of London. We learn from Mr. Ewing that the plant is doing excellent work; and in support of his statement, he has sent a sample of the sulphate made by it, as well as a small quantity of ordinary sulphate for comparison. It is certainly a good quality of salt, containing, we are informed, about 25½ per cent. of ammonia. The crystal is large, which is greatly in its favour for quick drying; the sulphate being practically ready for the market within a short time after being discharged from the saturator.

Engineering Standards.—Early last week, the result of the labours of the Engineering Standards Committee, which consists of 24 Committees and Sub-Committees of the most eminent men in the great iron and steel industries of the country, and to which the Government Departments have contributed 14 representatives, was published in pamphlet form by Messrs. W. Clowes and Sons, Limited. The Committees began their work in June, 1901, and took evidence on the advisability of standardizing the various kinds of iron and steel sections, and then proceeded to carry the standardization into practice. A sum of £30,000 has already been spent by the various technical institutions connected with the iron and steel trades, and the Prime Minister has promised to support the movement by Government funds. It is believed that within a twelvemonth British standard sections will be in operation in this country, with, it is estimated, a saving of some millions sterling to the British manufacturer and user. In structural steel alone these new sections will effect a reduction in cost, it is stated, of £750,000 per annum. The pamphlet contains nine lists, comprising equal, unequal, and bulb angles, bulb tees and plates, Z and T bars, channels, and beams. In the course of a letter on this subject addressed to "The Times," Sir John Wolfe Barry points out that these lists are only a first instalment, and cover but a small portion of the work which is being carried out by the Committee. In addition to the above subjects, Sub-Committees are engaged on equally important matters, and will shortly report to the main Committee. Four are dealing with electrical plant. The standardization of pipe-flanges will also before long be taken in hand, in co-operation with the Institution of Mechanical Engineers.

COMBINED OIL-CARBURETTED AND BLUE WATER-GAS PLANT AT SMETHWICK.

In this second article on the extensions which have been made, and are still in progress, at the Smethwick Corporation Gas-Works, attention will, in the main, be devoted to the combined oil-carburetted and blue water-gas plant which has been installed in the buildings of which a photograph was given last week in describing the coke-feeding plant. Of course, the coke plant and the water-gas plant are essentially quite distinct, and yet the one is a constitutive part of the other. The coke plant, as already stated, was constructed and installed by the New Conveyor Company, and the water-gas plant by the Economical Gas Apparatus Construction Company, Limited, of the English branch of which Mr. J. T. Westcott, the General Manager of the parent Company, is in charge.

The first article concluded at the coke storage and measuring hoppers in the water-gas generator house; and this will form a suitable point at which to pick up the thread of this descriptive essay. The novel features of this method of feeding the generators were fully explained last week; and the simplicity and expeditious operation of charging by these means were remarked upon. Indeed, against this system, the old hydraulic lift and the buggies now appear somewhat cumbersome. In part, this feeding plant at Smethwick is not unique—the overhead coke storage and conveying plant having been previously installed by the New Conveyor Company in connection with the carburetted water-gas plant at Leicester; and we believe that Mr. Alfred Colson's experience has determined him to extend this method of feeding the generators to the remainder of his plant. But in the plant already installed at Leicester, there is a difference compared with Smethwick. In the first place, at Leicester the coke charging plant is quite independent; while at Smethwick, as we showed last week, the coke travels direct from the coal-gas retorts to the water-gas plant entirely by mechanical means, and without a break in the journey. Herein is one of the several interesting features of the plant. At Leicester, again, the coke is raised to the overhead hoppers in the generator-room by means of the ordinary fixed bucket elevator and a new design of plate belt conveyor; while at Smethwick the elevator-conveyor gravity-bucket arrangement is employed, and this (as explained) takes its supply automatically from the elevated coke-conveyor in the yard, and thus obviates a considerable amount of manual labour.

Now before describing the water-gas plant and some of its special features, the buildings in which it is housed should receive some little attention. To say that they are anything but plain and solid would be to traduce the best architectural traditions of Smethwick. All the walls are of brick, built 18 inches thick. The dimensions of the generator-house are 36 ft. by 34 ft. by 38 ft. high to the eaves; and the operating-floor is 15 ft. 9 in. above the ground-level. Next to this (as will be seen by the photograph published last week) is the engine-house; and this is 40 ft. by 22 ft. When inspecting the new plant, the interior of the house was still unfinished; but it could be seen from the plans of Mr. Vincent Hughes that he intends the decoration to be of the most approved style, and worthy of the high-class machinery that he has, and will have, there under his command. The house is to be paved with Ruabon adamantine tiles, laid diagonally; the roof inside will be matchboarded and stained, except the portion which is covered with Heywood's patent glazing; and a dado 5 ft. 3 in. high, formed of pitch pine match-boarding, V-jointed, stained and varnished, will run round the house. Then comes the boiler-house. This is 40 ft. by 23 ft. 6 in.; and over it is fixed a cast-iron water-tank, 44 ft. by 28 ft. by 4 ft. 9 in. deep, with a capacity of 36,000 gallons. All the buildings are of a size sufficient to permit of the duplicating of the plant for which they have been erected. The adjoining chimney shaft is 100 feet high, and is a substantial brickwork structure. It should here be mentioned that the whole of the brickwork, except the chimney, was carried out by the gas-works staff, from Mr. Hughes's plans; and very sound and well-finished work they have turned out.

As already noticed, the plant is of the Economical Gas Apparatus Construction Company's type. The one set at present installed has a daily capacity of 500,000 cubic feet; and it is arranged for making oil-carburetted water-gas, or blue water gas in conjunction with a Whessoe-Munich carburettor. This is a feature to which we will refer later at greater length, after taking a general survey of the plant. The generator-room contains the generator, the superheater, the fixing chamber, washer, and oil-heater—that is, a complete set of the apparatus; and everything is arranged for duplicating at minimum cost, without disturbing this set. The whole of the coke-feeding plant, it will be remembered, is ready for the second instalment, which Mr. Hughes tells us it is proposed to take in hand before very long. This speaks well for his experience with the plant during the four or five months that he has had the benefit of its use. Adjoining the generator-house is the machinery room; and this contains the engine and blower, seven pumps, and combined engine and exhauster; the condenser and scrubber being fixed outside the generator house. As the accompanying plan shows, provision is made for the duplicating of the whole of this plant. The Economical Company also supplied the relief holder, the oil storage tank, tar-separator, and, in fact, the entire plant. The whole installation is situated in a corner of the yard, and is admirably concentrated and compact. Considering the effective agency of the plant as a contributor to the gas production of the works, the ground space occupied is very small.

Making a more minute inspection of the plant, the generator, it is seen, is of the usual type; but in its design, special attention has been given to the stoke-hole, clearing-doors, and fire-doors, so that it can be clinkered with a minimum amount of labour and expenditure of time. The blast, steam, and oil valves are also arranged close together, so that the operator has them completely under immediate control. Consequently, his day's work is considerably lightened by the relief from the necessity of walking constantly from one of the valves to the other, as is the case when they are situated far apart. The plant is also arranged with automatic valve gear, whereby, when the fixing chamber stack-valve is open, the washer-valve is closed—thus preventing gas getting back into the apparatus, which, if allowed, might cause an unpleasant explosion. This (the Economical Company claim) is a distinct novelty of their plant. The Company are, in fact, continually improving the details of their type of apparatus. Only recently, the water-cooled valves have been re-designed, so as to avoid trouble occurring with them. No matter what may happen owing to the failure of the water, or a mistake of the operator, it cannot, we learn, have any detrimental effect. The oil-injectors, too, have been improved in design; thus increasing the efficiency of the oil results. To-day, in several works, this type of plant is rendering as high an efficiency as 9 candles per gallon of oil used. In the plant at Smethwick, another point which should be emphasized is the comparatively small dimensions of the generator-room—only, as stated, 36 ft. by 34 ft. in area; and yet in this moderate space there is room for the manufacture of over a million cubic feet of gas in twenty-four hours from two sets of apparatus! This, it must at once be manifest to all, is a consideration in places where ground is high-priced. As in the case of the generator plant, so in that of the condensing and scrubbing plant, the main features have been previously described in the "JOURNAL;" and this relieves us of the necessity of further mentioning them.

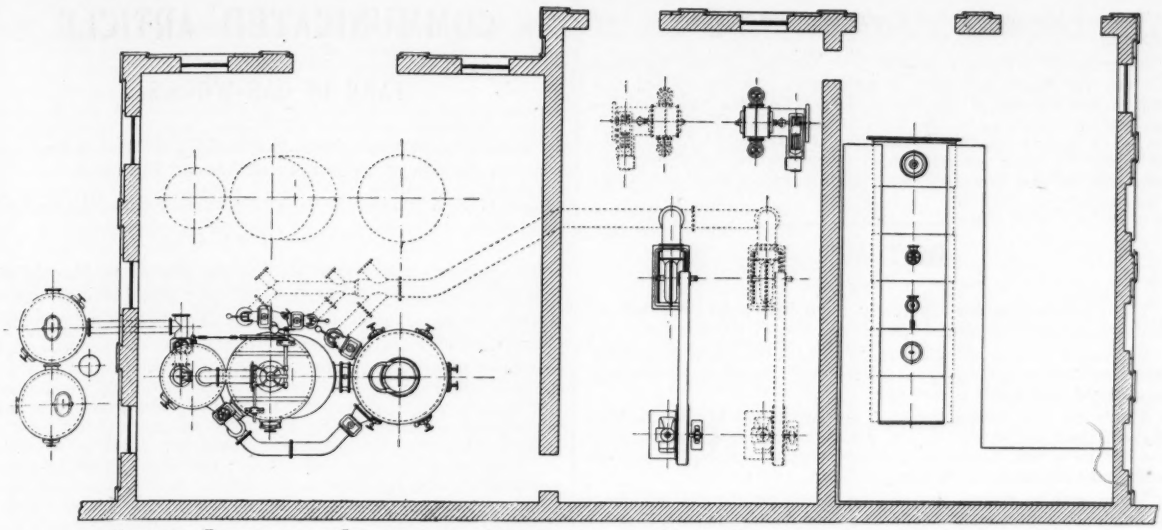
In the machinery-room there is one of Tangye's 35-horse power vertical steam-engines for driving the blast. This engine has been specially designed for meeting the peculiar requirements of this class of work; and its smoothness of operation is very pleasing. The blower is of the Sturtevant type, of the specially designed class for generator practice. The blower makes about 2400 revolutions per minute, and is capable of discharging something like 8935 cubic feet of air a minute. Hard by is a Waller exhauster (with engine) of an hourly capacity of 50,000 cubic feet. All the auxiliary machinery is made of ample size to deal with the total make from both sets of generating apparatus, leaving, when duplication takes place, one set always in reserve in case of accident or stoppage for any purpose. The foundations for the second sets are already in.

At present only one boiler is fixed; but provision is made for a second. It is of Thomas Hill and Sons' make, and has an evaporating power of about 4000 lbs. of water per hour. The boiler seating consists of Poulton and Son's patent curvilinear blocks.

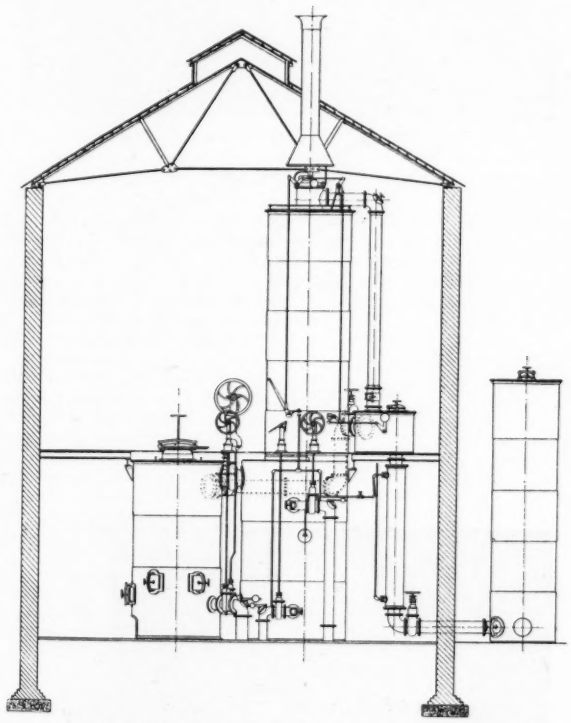
Taking the plant in the order in which it was inspected, we come next to the tar-separator. It is of the Contractors' special and novel design; but we have no details for publication as to its construction. It is claimed for it that it has "a superior efficiency over other types, as the water can be separated from the tar to within 1 per cent." Of this we can, of course, only speak as we have been informed; but 1 per cent. is very close to perfection, and the gains, both in regard to the sale and the fuel values, are obvious to gas engineers. The effluent matter from the washer and scrubber discharges by gravity into the separator, where it is divided into tar and water—the water overflowing into a small tank, from which it is pumped and re-circulated again through the washer and scrubber. The tar discharges itself automatically from the separator into a small tar-tank from which it can be delivered to the tar-well for sale; or, on the other hand, from the small tar-tank, it can be pumped into the feed-tank, whence it may be discharged, by gravity, into the fire-box of the boilers, through a tar-injector, and so used as fuel for firing.

Among the other plant to be noticed is the oil-storage tank. This is 28 feet in diameter, by 16 feet high, and is composed of steel plates $\frac{1}{16}$ in. and $\frac{3}{16}$ in. thick. Its capacity is about 60,000 gallons. The relief holder is constructed with a tank of steel plates $\frac{5}{16}$ in. thick. The holder is 40 feet diameter by 20 feet high, and is prepared for telescoping. Its present capacity is 25,000 cubic feet.

This completes the description of the plant; and now we will revert to the distinctive feature of the generating apparatus, to which an incidental reference was made earlier in this article. Briefly this feature consists of a complete bye-pass arrangement, with all necessary valves and connections, to enable the superheater and fixing chamber to be thrown out of action, in order that (instead of oil-carburetted water gas) blue water gas can be manufactured, or blue water gas for carburetting with benzol. The plant, in fact, is adapted for use in various ways, so as to permit



General Plan of the Combined Oil-Carburetted and Blue Water-Gas Plant at Smethwick.



Elevation of the Combined Oil-Carburetted and Blue Water-Gas Plant at Smethwick.

of gas being sent out of the works, under the conditions ruling at any particular time, at the lowest possible cost. If, for instance, a rich coal gas is being made, the blue water gas can be mixed with it direct, in order to reduce the candle power but enlarge the volume; or again, a mixture of the coal gas and blue water gas can be enriched to any candle power required by re-starting the production of carburetted water gas. Besides, in conjunction with the plant, is the Whessoe-Munich carburettor, so that, at any time when it is not desirable to make oil-carburetted water gas, and it is necessary to increase to a small extent the illuminating power of the mixed gases, the carburettor can be brought into action, and enrichment accomplished by the use of benzol. Therefore, at any time of the year, the mixtures can be varied in order to take advantage of the market value of the raw materials used in the production of the gases. This is an invaluable convenience. The plant indeed appears to be most complete for the utilization of, and adaptation to, all the best known methods of manufacturing and enriching gas. It will probably be found that the best results in the winter months will be achieved by mixing a certain quantity of blue water gas with the coal gas, and then enriching the mixture with carburetted water gas. At other times of the year, it may be found advantageous to make a large percentage of carburetted water gas, and let down as many of the coal-gas retorts as possible. Then, again, with a certain market value for materials, it may be advantageous to produce blue water gas, enrich with the benzol carburettor, and mix it with the coal gas, without the use of any oil-carburetted gas. The direction in which the plant will be mostly used will be seen when it is stated that, as a rule, the water gas made at Smethwick is of 17½ to 18 candle power, and this is reduced to about 16½ to 16¾ candle power. Really here Mr. Hughes has a plant which, in the variety of changes to be made, gives him the utmost freedom of choice in the work of producing his principal commodity on the cheapest and consequently the most advantageous lines. Both he and the Contractors are to be congratulated on their installation of a water-gas plant in which we have found so many interesting points on which to write.

Other work is proceeding at Smethwick; and all this shows that, since Mr. Hughes has been on the works, he has been kept extremely busy. Mention has been made of a large water-tank over the boiler-house. For the feeding of this large tank, and in order to save the use of town water, Messrs. Isler and Co. have sunk near by the water-gas plant an artesian well. This has been carried to a depth of 300 feet; the bore-hole being 12 inches diameter, lined with tubes 120 feet down. A magnificent supply of water has been secured. The tests reveal a reliable supply of 12,000 gallons per hour; and Mr. Hughes is confident that, if the works needed more water, two or three times this amount could be obtained from the well. The water is going to be raised by compressed air. Orders have been placed for the compressors; and in about a month's time, Mr. Hughes will be in the enjoyment of this copious supply of water within his own walls, and under his own immediate control.

Another large piece of work is the laying down of a fine set of four purifiers, 36 ft. by 24 ft. by 6 ft. The Contractors for these are Messrs. R. Dempster and Sons. Contiguous to the new purifiers, Mr. Hughes has brought to a useful level a large piece of ground by building a substantial retaining-wall, curving partly round one of the gasholders. This levelled-up space is intended for a revivifying ground in connection with the new purifiers. Adjoining these new purifiers a station-meter house is also in course of erection; and Messrs. J. & J. Braddock have in hand a meter of 125,000 cubic feet per hour capacity.

This completes the account of the new work recently finished and in progress at Smethwick; and we have to thank Mr. Hughes for his assistance in placing before our readers the interesting information contained in this and the previous article.

PERSONAL.

Mr. John Chisholm, of Airdrie, has been appointed Manager of the Airdrie and Coatbridge District Water Trust.

We learn that the managership of the Hindley Gas-Works has become vacant by the resignation of Mr. W. Dickinson.

In the Court of Appeal, last Tuesday, several gentlemen who have recently been appointed King's Counsel were called within the Bar in the accustomed form. Among them was Mr. George Spencer Bower, son of Mr. George Bower, of St. Neots.

Owing to the death of Sir W. D. King, one of the Directors of the Portsea Island Gas Company, a vacancy was caused on the Board. This has been filled by the appointment of Mr. Reginald J. E. Baker, son of the Chairman, Alderman Sir John Baker.

Out of about 170 applicants for the position of Manager of the Harwich Gas Company, in response to the invitation which recently appeared in the "Journal," Mr. W. B. Palmer, who is

at present Manager of the Uppingham Gas-Works, has been selected.

An interesting feature of the first meeting of the Swindon United Gas Company, noticed elsewhere, was the voting of a sum of 100 guineas to Mr. W. H. LUDGATE, who had filled the position of Chairman of the New Swindon Gas Company for a period of thirty years, for his services in that capacity, and especially for the extra work involved in connection with the amalgamation of the Company with the Swindon Gas and Coke Company.

OBITUARY.

The Pittenweem Gas Company have just been deprived by death of the services of their Secretary, Mr. T. NICHOLSON.

The death is announced of Mr. WILLIAM BLACK, who was for many years Manager of the Alnwick Gas Company—a position he relinquished about a year ago.

There has just passed away, at the advanced age of 92, Mrs. MARY ALDRIDGE, widow of Mr. Thomas Aldridge, who entered the service of the Exeter Gas Company in 1830, and remained with them till his death in 1873.

We regret to record the sudden death, on the 26th ult., from heart failure, at his residence, "The Weir," Hessle, of Mr. MARTIN SAMUELSON, M.Inst.C.E., who for 25 years had filled the position of Chairman of the Hessle Gas Company, Limited. By his death, Hull loses one of its oldest public servants. The great iron and shipbuilding firm of Messrs. Samuelson and Co. commenced business in 1849 as marine and general engineers; but in 1864 the concern was sold to the Humber Iron-Works and Shipbuilding Company, Limited. On severing his connection with the business, Mr. Samuelson commenced practice as a civil engineer, and gained a high reputation. He was Sheriff of Hull in 1857, and Mayor the following year. He had been for a long time a resident at Hessle, and took a prominent part in its affairs; having been Chairman of the District Council for three consecutive periods. He was also on the Commission of Peace for the East Riding of York. The deceased gentleman was 78 years of age, and he leaves a widow and a family. His brother is the Right Hon. Sir Bernhard Samuelson, Bart.

Professor Koch has been elected a Foreign Associate of the Paris Academy of Sciences, in succession to the late Professor Virchow.

M. Louis Weill-Goetz, one of the Directors of the Compagnie l'Union des Gaz, has been nominated a Chevalier of the Legion of Honour. M. Weill-Goetz is a member of the Société Technique du Gaz en France, having been admitted when the Society was formed in 1874.

An interesting lecture on "Gas Manufacture" was delivered a few days ago by Mr. Philip Moon, F.C.S., Assistant-Manager of the Norwich Gas-Works, before the Norfolk Society of Model Engineers. The lecture, which was followed with the keenest interest, was illustrated by limelight views and models; and at its conclusion Mr. Moon was accorded a hearty vote of thanks, on the motion of the Mayor of Norwich (Colonel J. R. Harvey), seconded by the City Engineer (Mr. A. E. Collins).

The Trade and Navigation Returns for January appeared in a revised form, as the outcome of the labours of a Departmental Committee who have been considering the question of classification. In the imports of oils, considerable alteration has been made; for whereas petroleum was formerly classified simply as "illuminating" and "lubricating," it now figures under six subdivisions—crude, lamp, spirit, lubricating, gas oil, and fuel oil. In the exports, under "dyestuffs," coal tar dyes and "other sorts" are shown separately.

The remarkable growth of the American Society of Civil Engineers is shown by the last report presented by the Board of Management. During the past twelve months, 362 applications for membership were received, and 328 persons elected. The net gain on the year was 185, against 191 for 1901 and 138 for 1900; the average gain for the past four years being 154. There are now 665 members of all classes residing within 50 miles of New York, and 2048 non-resident members; making together 2713. The library contains 47,597 books, specifications, maps, &c., valued at $48,425. At the close of last year, there was in hand a balance $26,297, against $15,993 at the end of 1901.

We have received from the Technical Publishing Company, Limited, "Continuous Current Dynamos and Motors and their Control," by W. R. Kelsey, B.Sc., Assoc.Inst.E.E. For the first portion of his work the author acknowledges his indebtedness to the writer of some articles in "The Practical Engineer;" but he has endeavoured to give a fairly complete account of the ways in which the principles dealt with are applied in the design and construction of the various forms of generators and motors, and to consider this subject in conjunction with the mechanical points involved. The text, which is amply illustrated, extends to 435 pages, and there is an index. We have also received from the same publishers "Specification for a Lancashire Boiler and Boiler Seating," by "Inspector."

COMMUNICATED ARTICLE.

FANS IN GAS-WORKS.

By R. GORDON MACKAY, Assoc.M.Inst.C.E., Member of the Berlin Section of the Society of German Engineers.

PART III.—APPLICATION OF THE FAN FOR GAS EXHAUSTING.

(*Continued from* p. 478.)

The writer is indebted to Mr. Charles Carpenter, M.Inst.C.E., and Mr. Joseph Tysoe, M.Inst.C.E., for permission to experiment with the fan exhausters at the Old Kent Road and East Greenwich works of the South Metropolitan Gas Company. It has been the custom of this Company for some time to pump gas from the East Greenwich works, not only to the consumers in the neighbourhood, but also to the Old Kent Road, to help to supply the ever-increasing demands of the rapidly growing population of the South Metropolitan area. First the work was done by means of rotary exhausters; but after a time fans were substituted, with resultant economy and largely increased capability, as well as increased safety—the fan allowing a through passage, even in the case of breakdowns. Approximate tests were made by the writer at Old Kent Road on March 4, 1901, and at East Greenwich on the 8th and 10th of the same month.

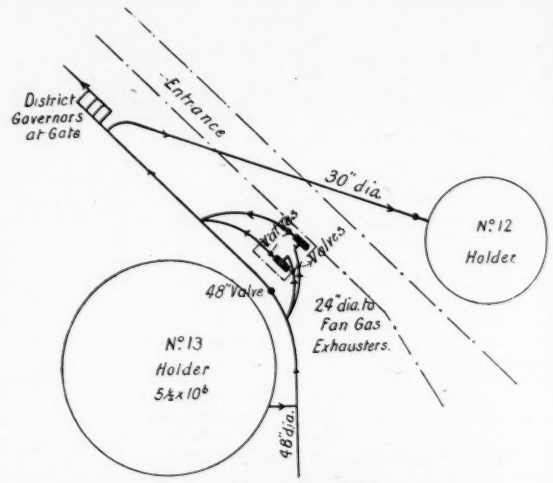


FIG. 11.—OLD KENT ROAD.

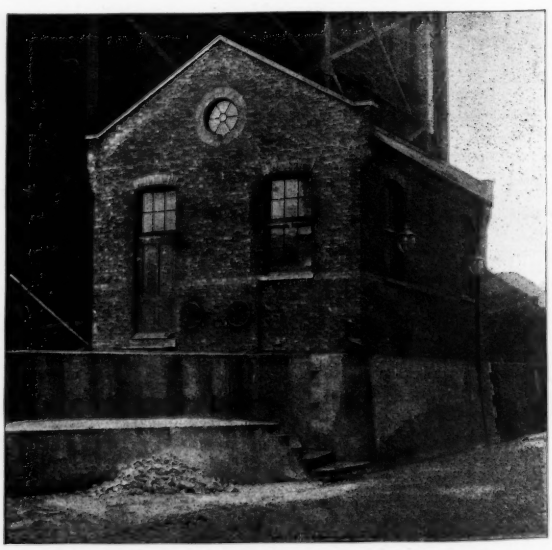


FIG. 12.—FAN-HOUSE AT THE OLD KENT ROAD WORKS.

Old Kent Road Gas-Works.—The object of the two fan exhausters is to take gas from one of the holders and force it through the main 48-inch gas-way to the governor-house, at which point four mains start—a 36-inch to Old Kent Road district, a 36-inch to Brixton, a 36-inch to Asylum Road, and an 18-inch to New Cross. The governors regulate the pressure to each main; and whatever gas is not required is pushed back by the fans to one of the holders, which thus becomes filled, and ready to take its place in supplying the demands of the four districts.

Fig. 11 shows diagrammatically the relative positions of the holders, the fan-house, and the governor-house. The fan-house is placed alongside No. 13 holder; the 48-inch main from East Greenwich passing underground between the house and the holder on its way to the governors. Figs. 12, 13, and 14 are reproduced from photographs taken by the writer. Fig. 12 shows the fan-house alongside holder No. 13. The hand-wheels of the 48-inch main valve and the 24 inches diameter fan inlet-valves may be also seen. Fig. 13 shows the two inlet bends up to the fans; only one fan being visible, and that not very distinctly, owing to the gas-engine meter being interposed. The valve on the fan-

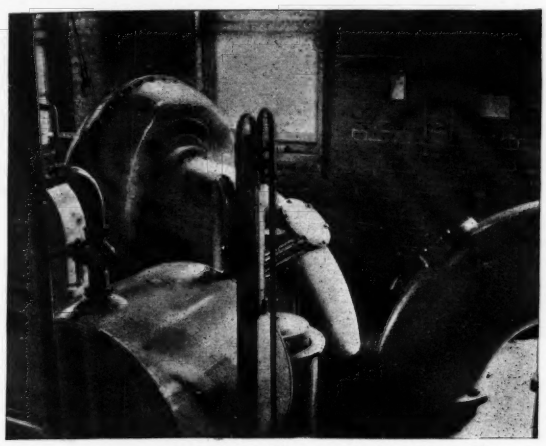


FIG. 13.—INTERIOR OF FAN-HOUSE AT THE OLD KENT ROAD WORKS.

outlet may be noticed on the left of the picture; and against the meter may be seen the differential water-gauge, which measures the effective pressure of the right-hand fan, of which the inlet-bend only is visible. Fig. 14 shows the three-cylinder vertical gas-engine which drives both fans, and is capable of indicating about 90-horse power. The whole arrangement is compact almost to a fault; but space is valuable, owing to the proximity of the main entrance way to the works.

Six tests were made, ranging over 2¾ hours, and during three tests spreading over 1½ hours nearly 1,600,000 cubic feet of gas was pumped from No. 13 holder to the governor-house, where the four mains to the district took what was required by consumers and the surplus passed back around an awkward bend and into holder No. 12. What passed into No. 12 holder could not be measured, owing to gas from Rotherhithe also entering this holder. Thus the initial pressure of No. 13 holder and the effective pressure of the fans overcame the resistance of the governors and bends, and lifted No. 12 holder. The tests were hardly complete, for want of a gauge on the fan-outlet for measuring the static pressure h when the outlet was closed. The indicated horse-power also of the engine could not be taken, for lack of indicators; but the six tests can be compared by the gas-meter readings, and show that most power is taken when circulating gas, in which case Q the quantity becomes large; least power when the fan-inlets are closed. Test No. 1 was remarkable, in that more gas was consumed by the engine when the fans were run with outlets closed and inlets open than when pumping gas through against the governors and the holder. Table IV. gives the results tabulated:—

TABLE IV.

No. of Test.	Duration of Test in Minutes.	Water Gauge Inches. Initial at Holder.	At Fan Outlet.	At Gate.	Back Pressure Holder.	Effective Pressure of Fan.	Gas Passed during Test by Fans.	Gas Passed per Minute.	Gas Meter Reading of Engine Consumption.	Engine Consumption during Test.	Speed of Fan. Revolutions per Minute.
							Cub. Ft.	Cub. Ft.	Cub. Ft. 816,020	Cub. Ft.	
1	15	Fan outlets closed; inlets open							816,295	275	1180
2	30	7⅞	12½	12½	11	4⅞	501,000	16,700	816,740	455	1190
3	30	7⅞	13⅜	13	11	6¼	621,000	20,700	817,200	460	1190
4	30	7¼	12⅜	12¼	11	5¼	473,000	15,800	817,640	440	1190
5	15	Fan outlets and inlets both closed							817,700	60	1190
6	15	Fans circulating gas							818,110	410	1180

In No. 2 test, the right fan was opened full; but the left one had the inlet open and outlet closed. No. 3 was made with both outlets fully open; and 621,000 cubic feet of gas was then taken out of No. 13 holder in half-an-hour. No. 4 was made with the right-hand fan closed, but the left-hand fan open—the reverse of No. 2. In No. 5, the 48-inch valve (see fig. 12) had to be closed to prevent the gas from No. 12 holder (11 inches pressure) getting back to No. 13 (7¼ inches pressure). In No. 6 test, the 48-inch valve was, of course, open, and allowed the gas from the fan outlets to pass into the inlets again—so permitting the fans to pass their maximum amount of gas, and accordingly to take their maximum power with the conditions in vogue.

There was some difficulty in determining the size of the wheel inside the fan-casing; but the writer was fortunate enough to find one of the same sized exhausters in course of erection at East Greenwich, which was promptly measured, and the following dimensions were obtained:—

Size of Fan, No. II. Gas Exhauster.

Diameter of inlet and outlet	24 inches
Diameter of wheel	48 ,,
Width of tips	12 ,,
Width of outle	18¾ ,,

There were six vanes commencing radially, but terminating at the tips with the unscientific backward bend which necessarily reduces the manometric yield, as was pointed out in Part I., fig. 1, case 3. The want of proportion here is very apparent, as may be seen from the following:—

Area of fan inlet	3·14 sq. ft.
,, ,, outle	9·80 ,,
,, ,, tips	12·60 ,,

It is therefore impossible to base calculations on the tip area, since the tips are four times as great as the inlet.

Now in formula (2) the total theoretical pressure from a fan wheel having a circumferential velocity u feet per second is

$$H_o = \frac{u^2}{g}\,\gamma\,\frac{459 + 32}{\gamma_o\,459 + t}\,12$$

where $u = \pi . 4 . \frac{1190}{60} = 250$ feet per second.

$\gamma = 0{\cdot}04$ weight of a cubic foot of the gas
$\gamma_o = 62{\cdot}3$,, ,, ,, water
$t = 50°$ Fahr.

and ∴ in this case the theoretical total pressure is

$$H_o = u^2 \times 0{\cdot}00023 = 14{\cdot}4 \text{ inches.}$$

Such a trial is far from conclusive, except to show the great practical use of fans for handling gas, and so enabling the pressures to be almost independent of the lifts of holders.

East Greenwich Gas-Works.—At the base of the gigantic twelve million cubic feet holder, and under the wing also of the eight million cubic feet holder, stands the fan-house, lately increased in length to take reserve fan sets. Looking down upon the Blackwall Avenue, few only of the passers by are aware of the interesting plant that daily transfers gas from the giant holders, to distant parts of the South Metropolitan Company's area.

In the fan-house are no less than four large fan-exhausters each driven by a separate gas-engine and counter-shaft. These are not all used for the same purpose; the No. 9 exhausters being employed for transferring gas to the 48-inch main supplying Old Kent Road and West Greenwich, and Nos. 10 and 11 for what is known as pumping pressure into the district governors on the 36-inch main to Woolwich and the 12-inch main to Vanbrugh Hill.

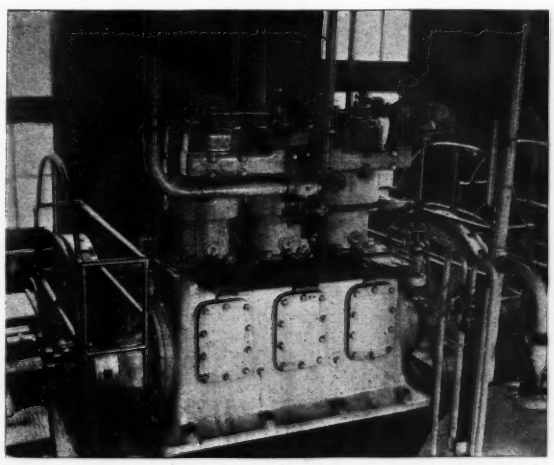


FIG. 14.—INTERIOR OF FAN-HOUSE AT THE OLD KENT ROAD WORKS.

Fig. 15 is a diagrammatic view of the arrangement of the mains at the fan-house. It is merely a plan sketch, and does not show any indication of the number of turns and bends which it was necessary to introduce into the system. The four fans stand with their outlets facing Blackwall Avenue; and, in contradistinction to the arrangement shown in fig. 10, they have bottom horizontal outlets, and therefore have to discharge through a bend in order to reach the underground system. The inlets of the fans are connected to the 48-inch main from the two holders;

and the number of arrangements possible by the correct manipulation of the somewhat intricate system of valves, is extremely interesting. Each fan has its inlet and outlet valve, so that it may be entirely shut off from the whole system.

Fig. 16 shows the approximate relative positions of the fan-house and holders and the arrangement necessary when transferring gas from holder to holder. In general, Old Kent Road requires a large supply of gas during the evening; and in order to meet this demand, one of the holders is filled up in anticipation. To measure the amount of gas passing through the fan, it

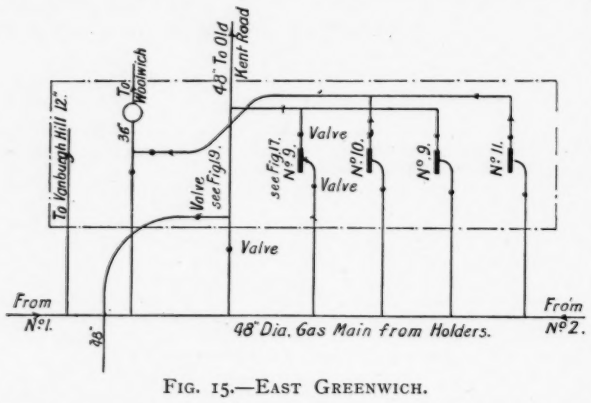


FIG. 15.—EAST GREENWICH.

is either necessary to employ a Pitot tube or to make use of the movement of plates on the holder. In the absence of a Pitot tube, the latter was the method adopted; and it was therefore necessary to visit the gas-works when no gas was being made in the retort-houses, and consequently the supply holder had the inlet valve tight closed. No. 2 (the twelve million capacity holder) has six lifts, each lift having 15 plates, and each plate 36 rivets; and a table was always to hand showing the amount of gas per rivet

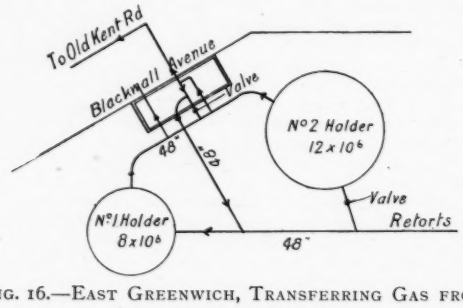


FIG. 16.—EAST GREENWICH, TRANSFERRING GAS FROM NO. 2 TO NO. 1 HOLDER.

space—in general about 6000 cubic feet. It was useless to check the amount from what was passing into No. 1 (the eight million holder), because there was a continual demand from the neighbouring districts which was answered by this holder.

A run was made with the No. 9 fan and the 80 indicated horse power gas-engine from 4.30 p.m. to 5.40 p.m. on March 8, when the engine was indicated and the pressure and gas-meter readings were taken. A 24-inch gauge glass was put on to the bend between the fan outlet and the outlet valve; so that the reading

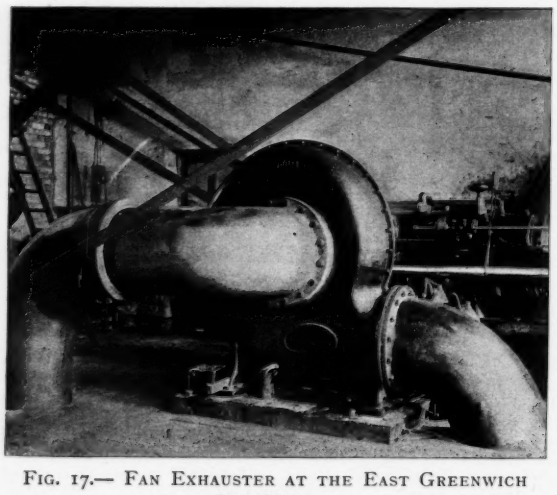


FIG. 17.— FAN EXHAUSTER AT THE EAST GREENWICH GAS-WORKS.

of the pressure when the outlet was closed could be taken. Previously to starting the test, the engine was made to drive the counter shaft only so that the actual brake horse power absorbed by the fan might be determined. The engine speed was 184 revolutions per minute; and when driving counter shaft only, it took 18·5 explosions per minute; giving a mean effective pressure of 104 lbs. per square inch, or 15·7 indicated horse power.

The following results were then obtained:—

TABLE V.

[Engine driving countershaft and itself at 184 revolutions per minute; number of explosions, 18·5; indicated horse power of engine, 15·7.]

No. of Test.	Duration.	Pressure at Fan Inlet due to Holder.	Pressure at Fan Outlet.	Back-Pressure of Holder.	Differential Static Pressure of Fan.	Cubic Feet of Gas Passed during Test.	Cubic Feet of Gas Passed per Minute.	Speed of Fan, Revolutions per Minute.	No of Explosions of Gas-Engine.	I.H.P. of Engine.	H.P. Absorbed by Fan.	Cubic Feet of Gas Used during Test.
1	2	3	4	5	6	7	8	9	10	11	12	13
1	30	7⅜	13	Inlet and outlet of fan closed				1643	33	27·9	12·2	300
2	25	8⅝	19⅜	Inlet open, outlet closed				1654	35	30·3	14·6	195
3	15	8¼	11	2¼	Circulating gas			1643	71	62·0	44·3	235
4	20	6½	16¾	Inlet open and outlet of fan closed				1648	51	44·0	28·3	200
5	30	6⅜	10 Outlet full	8	3⅜	503,000	16,800	1648	86	75·0	59·3	415
6	15	5½	12 Outlet ⅜	8	6½	244,000	16,260	1648	83	72·4	56·7	210
7	15	5½	16 Outlet ¼	8	10½	166,000	11,050	1648	74	64·5	48·8	195

In test No. 4, it is again shown that the fan takes considerable power when running with the inlet open and the outlet closed; and it is most probable an inaccuracy crept in during test No. 2, which the writer thinks is unreliable, as it will not compare with other results (see Table IV.). It is evident that, if it be required to shut off a fan, it is more economical to shut off its inlet than its outlet. Tests Nos. 5, 6, and 7 were made when the retorts were shut down; and therefore the amount of gas taken from the twelve million capacity holder could be measured. The inlet to holder No. 2 was closed, and also the 48-inch valve bye-passing the fan; while the 48-inch valve at the beginning of the fine 48-inch diameter bend leading back to the holders was, of course, open, as well as the inlet to holder N (see fig. 16).

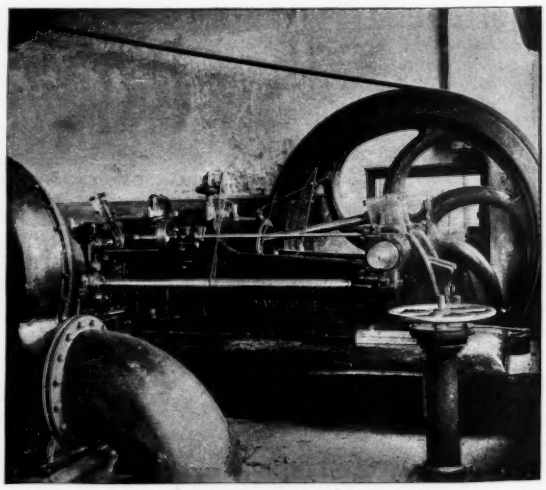


FIG. 18.

Figs. 17, 18, and 19 are reproduced from photographs taken by the writer. Fig. 17 shows the No. 9 gas-exhauster, with its inlet and outlet bends. Both inlet and outlet valves are in the basement; but the outlet valve only is at present worked from the fan room floor. The photograph was taken before the 24-inch gauge glass was put on to the outlet-bend; so that this interesting fixing is unfortunately not visible. Fig. 18 shows the single-cylinder horizontal gas-engine which drives from an 8-foot fly wheel on to a 24 inch by 32 inch countershaft, and down to a 12 inch diameter pulley on the fan. The belts are 12 inches wide. The engine is 14 inches diameter by 21 inches stroke, and made 184 revolutions per minute. The indicator is seen in the picture. The maximum number of explosions possible at this speed would be 92; so that test No. 5 was approaching the limit of power. Fig. 19 is interesting, in that it shows the 48-inch diameter bend and valve, in the basement, on the main for transferring gas from holder to

holder. Some idea may thus be gained of the easy bends the Company's Engineers have now and then put down. The basement is quite a curious sight, with its endless ramifications, valves, and gas-pipes, for the efficient distribution of gas some miles away from the point of generation.

The above tests cannot be claimed as immaculate; but, as far as possible, working conditions were adopted. On March 10, when no indicator diagrams were taken, the number of the explosions were carefully counted both by the writer and by Mr. W. Haytock, the Machinery Superintendent; so that the indicated

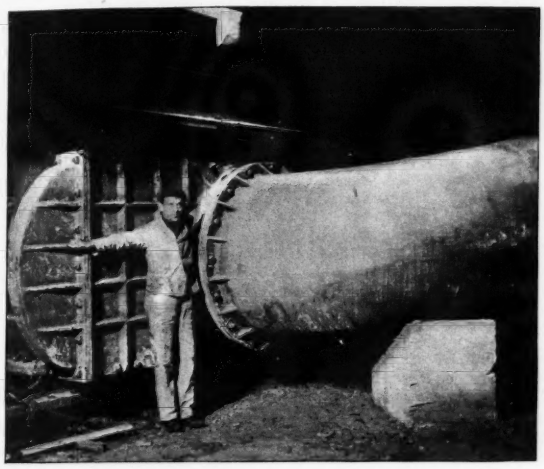


FIG. 19.—FORTY-EIGHT INCH DIAMETER BEND AND VALVE.

horse power of the engine could easily be arrived at from the diagrams taken two days before. The results obtained must now be criticized, in order to arrive at the manometric yield and the mechanical efficiency of the fan.

(1) *Manometric Yield.*—With radially-tipped vanes, the theoretical pressure can be calculated from formula (2), where

$$H_o = \frac{u^2}{g} \quad \frac{\gamma}{\gamma_o} \quad \frac{459 + 32}{459 + t.} \quad 12$$

Now, it was shown in fig. 1., Part I., that for vanes curved to the outlet of the fan, the velocity of the air leaving the vanes was

$$\sqrt{2u^2 + 2u^2 \cos \alpha}.$$

and since *cos* α is negative when α exceeds 90°, the manometric yield is decreased below that given by the radial vane. When calculating H_o for No. II. exhauster, it was shown that

$$H_o = u^2 \times 0{\cdot}00023,$$

which formula holds good for gas of specific gravity 0·5 and temperature 50° Fahr.

Since the diameter of the wheel was 3 ft. 4 in., the circumferential speed of the tips becomes 288 feet per second at 1648 revolutions per minute, and therefore

$$H_o = 19{\cdot}2''.$$

But tests Nos. 2 and 4, Table V., gave the maximum pressure at the outlet when the outlet was closed as 10·625 inches; and therefore, since the manometric yield k is equal to

$$\frac{H}{H_o}$$

where H = 10·625, then k = 56 per cent., which may be considered as the manometric yield of the fan wheels as used.

(2) *Mechanical Efficiency.*—The theoretical power is obtained from formula (8) where

P = Q × 5·2 H foot-pounds per second,
and Q = cubic feet of gas per second.
H = total pressure of the fan in inches.

While running at 1648 revolutions per minute, and the vanes giving a manometic yield of 56 per cent., H is 10·625 inches. Then in test No. 5, Table V, where Q = 280 cubic feet per second, the theoretical horse power becomes

$$\frac{280 \times 5{\cdot}2 \times 10{\cdot}625}{550} = 28{\cdot}2$$

The actual horse power taken by the fan was 59·3, so that the

$$\text{mechanical efficiency} = \frac{28{\cdot}2}{59{\cdot}3} = 47{\cdot}5 \text{ per cent.}$$

If calculated from test No. 6, the mechanical efficiency becomes 48 per cent., and if from No. 7 test 38 per cent.; but the latter is not a fair comparison, as the outlet is too far closed. Had the vanes been radial, or had they been curved forwards instead of backwards, a higher mechanical efficiency would in all probability have resulted.

Dr. Percy F. Frankland, F.R.S., Professor of Chemistry and Metallurgy in the Birmingham University, has been elected Vice-President of the Institute of Chemistry.

TECHNICAL RECORD.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Annual General Meeting of the Association was held at the Grand Hotel, Birmingham, on Thursday. There was an average attendance of members, who gave to the retiring President, Mr. CHARLES HUNT (London), and the incoming President, Mr. CHARLES MEIKLEJOHN (Rugby), a very hearty reception at the opening of the proceedings. At the outset, Mr. Hunt occupied the chair.

The HON. SECRETARY (Mr. A. Cooke, of Oldbury) read the minutes of the autumn meeting held on Oct. 11; and they were confirmed.

REPORT AND ACCOUNTS.

On the motion of the CHAIRMAN, seconded by Mr. W. NORTH (Stourbridge), the report and accounts were taken as read and adopted. The former recounted the work of the past year, and, among general matters, mentioned that six new members had joined the Association in the year, one member had died, and two members lapsed as per rule 15—leaving a membership of 99. The accounts showed a balance brought forward of £110; and the receipts of the year brought this up to £173 2s. 9d. After defraying all charges, the balance in the bank is £125 12s. 8d.

THE NEW PRESIDENT.

The CHAIRMAN said the time had arrived for him to transfer the duties of the chair to his successor. Mr. Meiklejohn needed no introduction from him. He was known to every member, and they all knew that the present position of the Association was largely due to his efforts as Hon. Secretary. Knowing this, they were sure the future was perfectly safe in his hands. He had much pleasure in asking Mr. Meiklejohn to take the chair.

On doing this, the new PRESIDENT had a very enthusiastic greeting from the members.

THE BENEVOLENT FUND OF THE GAS INSTITUTION.

The next item on the *agenda* was the following: "To vote a sum of twenty-five guineas to the Benevolent Fund of the Institution of Gas Engineers."

The PRESIDENT said he was exceedingly obliged for the kind words with which Mr. Hunt had introduced him to the office of President of the Association. He would not waste time, but refer to the item on the *agenda* which it was intended to bring before the members for decision that day with regard to voting a sum of 25 guineas to the benevolent fund of the Institution. Inasmuch, however, as the discussion that had recently taken place at the meeting of the Institution in London had left the matter in an undecided state as to the future of the benevolent fund, he thought perhaps it would be preferable to postpone consideration of the matter until a future meeting. He therefore suggested that it be left over until the October meeting.

Mr. T. BERRIDGE (Leamington) seconded the motion.

The PRESIDENT, replying to Mr. W. North and Mr. H. Peaty, said that nothing had yet been done in the matter of voting the sum named. He did not think that Mr. Peaty was aware of the discussion that had taken place at the meeting of the Institution. From what then transpired, it was manifest that it was uncertain whether the benevolent fund could be transferred to the new Institution as such, or must of necessity be retained for the members originally belonging to the Institute.

Mr. PEATY agreed that, in that case, it was wise not to do anything at present.

The PRESIDENT then read the following

INAUGURAL ADDRESS.

Gentlemen,—It is customary in the construction of all presidential addresses to sound an opening note of deep thankfulness for the honour conferred; but being somewhat given to introspection, and having failed to discover any feeling of gratitude in my heart, I hope you will pardon the omission on this occasion, and recognize what I sincerely believe—that, in thus deviating from the usual course, the practice is more honored in the breach than by its observance, and I may still retain a place in your esteem as a truthful and honest man. Yet I would not have you think for a moment that I am unmindful of the honour of presiding over an important Technical Association like the Midland Association of Gas Managers, with its long roll of distinguished Presidents, and its twenty-five years of useful work, or that I am incapable of appreciating your kind and too indulgent decision to confer that honour upon me. I have, however, been deeply impressed with the tendency of the times to belittle the claims of experience and to magnify the advantages of youth in the onward march of the industry; and while I believe that this idea has been pressed somewhat unduly, to the hurt of men who have struggled valiantly against great odds, I confess that my feelings to-day are not those of thankfulness, but of trepidation and dismay, when I realize that I am but partially equipped for the discharge of the duties of this high office with a qualification of so little value as my limited experience may attest, while I

have but a feeble and daily diminishing claim on the qualification that is valued most—namely, that of youth. But my thankfulness will be real, and my gratitude deep, if at the close of my year of office I may claim a title to your regard as one who did not shirk the responsibility the honour entails, nor yet refused to give of his best, however poor the gift, to promote the interests of the Association and the well-being of its members.

Having been for seventeen years a member of the Association, and for the majority of those years actively connected with you in its work, I must confess that the qualifications of a President have on many occasions occupied my mind; and I am quite sincere when I state that, had the appointment been in my own hands, I would not at the present moment be addressing you. That I yielded to your kind decision in asking me to accept the office, is no proof of a change of view on my part, but is due to the fact that in the course of the ten years I occupied the office of Honorary Secretary to the Association I became thoroughly convinced that the success of this and kindred Societies depends not so much on the brilliance of the few as on the willingness of each member to do what he can—nothing more than this—to promote that success. Of the amount of self-effacing modesty that can exist among one hundred gas engineers, none but an Honorary Secretary of some years' standing can have the remotest conception; and I may be pardoned if I deliberately refrained from adding to a total I already consider rather appalling.

The Capital Account.

Though the whole of my life since leaving school has been spent in the gas industry, of the eighteen years I have been in full charge practically the whole of that time has been occupied in general management rather than in structural alterations and extensions or in the pursuit of any special line of research. The first eight years were spent in trying to make ends meet in charge of an undertaking with a capital exactly double what it should have been, and with dead charges for interest and repayment of loans of 1s. 3½d. per 1000 cubic feet of gas sold. During my first year of office, it was my painful duty to renew a tar contract which expired at £2 10s. to £3 per ton at the cheering rate of 10s. per ton! I need not say that my predecessor in office was in no way responsible for the heavy outlay on capital account; the works having been newly built prior to his appointment by "an expert" on commission—and, of course, on a low commission, for municipal traders will sometimes insist on having things cheap! I know of no experience so likely to vividly impress one with the enormity of the crime of "boat burning" as to have to trace the progress of the boat by the trail of the ashes of mis-spent capital, which alone denotes the spot where the good ship should have ridden at anchor.

Having been delivered from the terror of this eight years' nightmare, you will readily understand that I suffer from a tendency to case-hardening against the shafts of Progressive Journalism, which can only see ability in a retort "cocked up" at one end, and up-to-date qualification in a large percentage of carbonic oxide in the gas supplied.

Inclined Retorts.

The reason "Why Milwaukee did not Build Inclines," or why Edinburgh adopted them, may be of absorbing interest to the places named; but I do not think it has yet been established on a strictly comparable basis that the matter is a vital one to the industry at large. The splendid series of articles now appearing in the "Journal of Gas Lighting" from the pen of Mr. Herring, may prove this to a demonstration; and while admitting the unique opportunity at his disposal in the erection of the new works at Granton, every gas engineer will await with unabated interest the completion of the record and the full statement of the working results obtained, which Mr. Herring has promised to supply. In equipping his new works at Granton with inclined retorts throughout, Mr. Herring has exhibited the courage which deserves success; and I am confident that Edinburgh will have no reason to regret his decision. I may, however, be pardoned if, in the present state of our knowledge on the subject, I express a doubt on the wisdom of recommending the pulling down of one system to substitute the other; and I would utter a note of warning that even the youngest, I hope, may take in good part—that, however heroic the burning of boats may be, it stills rests with the owners of the ship to enforce the construction of a raft that the incendiarist may escape with his life.

The Work of the Association.

In addressing you this afternoon, I propose to briefly review the work, of the Association, to inquire as to the results of that work, and whether improvement is possible, and, arising out of those points, to consider some of the topics of greatest interest to the industry we represent and the best means of securing its continued and increasing prosperity. When Mr. John Morley visited the United States some years ago, he was very much surprised to find that the history classes in their common schools all began their work with the year 1776, when the American Colonies formed themselves into an independent Confederacy. The teaching assumed that the creation of the universe occurred about that date! I would not have you think that I am emulating this American method in directing your attention to a review of the work accomplished by the Association; but after an existence of twenty-five years, when Technical Education and Technical Societies are very much in the air, while we do not assume that the best history of the industry even during the period covered will be found among its records, yet it seems to me of supreme importance for us to scrutinize those records, that we may ascertain whether its existence is justified by results, and whether it may not be possible to effect some improvement in the constitution or management of the Association that will tend to the advantage of members, and prove of greater benefit to the industry we represent.

In this survey, which of necessity must be brief, I find that out of sixty papers contributed by the members, the subjects dealt with were distributed as follows:—

18 to the Retort-House and Carbonizing.
2 to Condensation.
1 to the Exhauster.
2 to Washers and Scrubbers.
5 to Purification.
1 to Illuminating Power.
2 to Distribution.
6 to Commercial Topics.
3 to Public Lighting.
1 to Coal Testing.
1 to the Transportation of Materials.
1 to the Training of a Gas Engineer.
5 to Auxiliary Processes.
4 to the Competitors of the Industry.
4 to Descriptions of Works Visited or Extensions in hand at the [date of visit.
33 Visits of Inspection were made to Gas-Works in the District.

From the number of papers devoted to the retort-house and carbonizing, it is evident that in the minds of the members the old saying holds good that "dividends are made in the retort-house"—as it is this particular branch of our work to which the greatest mental activity has been devoted. Under this heading, the following subjects have been dealt with—viz., furnaces for heating by tar and coal slack, direct fired, generator, and regenerator furnaces, brick and tile retorts, clay retorts, stoking machinery, and inclined retorts; and in my opinion the ground has been fairly well covered.

On most of the other subjects, it is far otherwise. That "dividends are retained, or in great part lost, in distribution" is a saying as true as the one already quoted, though the analysis of the contributions on this subject gives no indication of its importance. I have long been of opinion that sufficient attention is not devoted to the question of unaccounted-for gas; and, indeed, in many cases the title is to a large extent a misnomer; and careful examination of the circumstances would supply a shorter, but probably a more expressive, qualification. Admitting that there are places and districts subject to subsidences, &c., and to which no general rule would apply, I am satisfied that, with a sound distribution system which receives a constant and unremitting supervision, 3 to 4 per cent. of unaccounted-for gas is an ample margin; and the aim of every manager should be to keep within it. Unless "the make" of gas per ton bears a definite relation to the quantity "sold" per ton, the former should not be stated without qualifications, as an increase in the make alone is of no value.

That the only paper on illuminating power was read eighteen years ago, when the argument was in favour of development, surely suggests that we have been lagging behind in this direction, as the reduction of illuminating power (provided the cost to the consumer is lowered in proportion to the heating value of the gas), and the necessity for the establishment of a calorific standard, is now the tendency of the times. Again, since the last paper was read on public lighting, actually twenty-two years have elapsed. But, in the meantime, the lighting of our public streets has been revolutionized by the Welsbach mantle; and by a consensus of opinion, not only of gas companies, but including some of the most important municipal bodies, incandescent gas "holds the field" for street lighting. Many, if not all, of the members of the Association have had ample experience in this subject; and papers should be at once forthcoming. Of the communications on washing and scrubbing, little need be said so far as the recovery of ammonia is concerned, as there is little room for improvement in the construction of the apparatus or in its working efficiency. Regarding the papers on the commercial aspects of the industry, I have included such subjects as differential prices, weekly and monthly payments, automatic meters, and the hiring of gas-stoves, &c. The papers on auxiliary processes include water gas, the use of oil for producing illuminating gas, sulphate of ammonia, and other chemical processes; and of the competitors of the industry, we had papers on oil, acetylene, and electricity.

I must confess that I am disappointed in the result of my scrutiny of the technical records of the Association; and I am confirmed in my earlier impressions of the extreme disadvantage to the general good of a too retiring disposition. I hope that the blanks, some of which I have indicated, will be speedily filled up, and that each member will feel it incumbent upon him to do his part to keep the records of the Association up to, and abreast of, the best—and most—modern practice in every department of our work.

To the 33 visits to the various gas-works of the district, I attach very great importance; and as out of this number six were paid to Windsor Street and six to Saltley—where we have from

time to time seen great extensions carried out, and have been privileged to visit those extensions both during erection and after completion, and have had the opportunity to inspect every modern appliance in use there—the educational value of those visits can scarcely be over-estimated.

And, finally, in the brilliant efforts of my predecessors in the presidential chair much that is lacking in the record of papers read would be atoned for; and to this source high technical value may be attributed. But as, happily (I speak feelingly), the President is safeguarded from attack by the unwritten law which precludes the free expression of opinion or any general discussion on the points included in his address, the want of papers and the free interchange of ideas and experiences, must be regarded as a distinct loss.

I commend this matter to your earnest and careful consideration; and I feel confident that, by a general willingness on the part of each member to recognize his responsibility and to act upon it, the work of the Association would be greatly improved. I further believe that the usefulness of the Association would be increased by the widening of our borders—by the admission of superintendents and assistants, and extending a helping hand to the students of the industry.

Ventilation.

The subject of ventilation has been brought to the notice of the general public with somewhat startling vividness by the report by Mr. D. A. Sutherland, F.I.C., F.C.S., on the atmosphere of the Central London Railway, which appeared in the London "Daily Mail" of Dec. 18 last. And, however disposed one may be to treat that report as the product of sensational journalism, it is evident from the efforts made by the Company to improve the ventilation, and from the independent inquiry recommended by the London County Council, that, while the danger to health may have been exaggerated, the contamination of the air in the "Tube" by the lungs of the passengers is beyond question; and the necessity for the removal of this contaminated air is a pressing need. I am not disposed to cavil at the general conclusion arrived at by Mr. Sutherland—viz., "that the condition of the atmosphere in the 'Tube,' as disclosed by my experiments, is, during the period of heavy traffic, insanitary and injurious to health." I refer to this report, however, only for the purpose of pointing out that, without a single gas-burner being used for lighting either in the "Tube," carriages, stations, or approaches thereto, "products of combustion" are impurities of the "Tube," and the necessity for their removal is admitted. Here is a case, then, where electricity only is used for lighting, with a contaminated atmosphere, charged with "products of combustion," not of coal gas, but emanating from the lungs of the people—a more insidious and dangerous impurity.

That this is an established fact emphasizes the desirability of removing, in the most effective and efficient manner possible, the products of combustion due to respiration from the houses of the people, and from all buildings in which numbers of the public may assemble. The necessity for this has not been left to be "discovered" by the Daily Press, nor to the construction of the "Tuppenny Tube," as an illustration of the evil effects produced by the neglect of proper ventilation. From Roscoe and Schorlemmer's Treatise on Chemistry (1884 Ed.), published before the "Daily Mail" or the "Tuppenny Tube" were heard of, I may be permitted to give the following extract:—

> The volatile organic products arising from putrefaction which are always present in the air, appear to exist in larger quantities in marshy districts than elsewhere; and in all probability they are the cause of the unhealthiness of such situations. The unpleasant odour invariably noticed on entering from the fresh air into a closed inhabited space, is also due to the presence of the same organic putrescent bodies; while the oppressive feelings which frequently accompany a continued habitation of such spaces do not proceed from a diminished supply of oxygen or an increase in the atmospheric carbonic acid, but are to be ascribed to the influence of these organic emanations. Hence the subject of ventilation is one of the greatest consequence to well-being, as well as to comfort; and it is necessary to provide for a continual renewal of the deteriorated air. Fortunately, this renewal takes place to a considerable extent in a room, even when doors and windows are shut, by what may be called the natural means of ventilation—by the chimney, by cracks and crevices in doors and windows, and especially through the walls. Almost instinctively, man appears to have chosen porous building materials, thus permitting, by gaseous diffusion, an exchange of fresh for deteriorated air. The well-known unhealthiness of new and damp houses, as well as those built of iron, is to a great extent to be attributed to the fact that the walls do not permit a free diffusion to go on.

I am free to admit that the addition of the products of combustion of coal gas to the products of combustion of respiration would not help matters, were both of necessity retained in an inhabited room or building; but I assert that, while the substitution of electric for gas lighting fails to remove the most offensive impurities of the atmosphere, it also lacks the value of the rough indicator afforded by the heat of the older illuminant, which becomes manifest in every ill-ventilated room, and compels attention to the necessity for a fresh air supply.

If, however, our electrical friends insist that the ideal system of lighting is by electricity, supplemented as it must be by an efficient system of ventilation, then, whatever the cost of ventilation may be, it should be taken into consideration as an increase in the cost of luxurious lighting, inasmuch as the lighting can be made more effective, and equally efficient ventilation secured, by coal gas intelligently consumed, whereby the products of combustion and the heat generated are utilized to effect the complete elimination of the more deleterious products of respiration, and thus keep the air sweet and pure.

That this is no mere statement of theory, but the actual result of successful practice, I quote in proof the report of Professor Percy Frankland, F.R.S., on the lighting of the Art Gallery of the Birmingham Corporation, in which he states the results of carefully conducted experiments made with the view to determine the best method of illumination, having due regard to the preservation of the art treasures exhibited therein. The air was in each case abstracted for analysis at three different levels: (*a*) 31 feet from the floor; (*b*) 14 ft. 6 in. from the floor; and (*c*) at the floor-level. As to the result, I quote Professor Frankland's own words.

> The results are recorded in Table III.* From these it will be seen that on each of the two occasions on which no artificial illumination was employed, there was a very slight increase in the percentage of carbonic acid in the air, the increase being more marked on the day on which there was the larger number of visitors to the galleries. On both occasions on which the gallery was illuminated with electric arc lamps, there was an increase in the proportion of carbonic acid in the air. Finally, on both occasions on which incandescent gas was used, there was a diminution in the percentage of carbonic acid in the air; this diminution on the first occasion taking place, notwithstanding the contributions of carbonic acid to the air, by an exceptionally large number of visitors who attended the gallery on the market day.
>
> These experiments clearly show that, under the conditions of ventilation prevailing at the time—
>
> (*a*) In the absence of any artificial illumination, there is a slight increase in the percentage of carbonic acid in the air of the gallery during the course of the day.
>
> (*b*) With the arc lamp illumination the increase in the percentage of carbonic acid is distinctly more marked.
>
> (*c*) With the incandescent gas illumination, on the other hand, instead of there being any increase, there is a distinct diminution in the percentage of carbonic acid in the air.
>
> The explanation of this diminution is not far to seek, it being obviously due to the more efficient ventilation, of the gallery, which is caused by the great draught of heated air through the shafts which are placed above the incandescent burners.
>
> The products of combustion are completely carried off by the ventilation which is so much promoted by these burners.
>
> In my opinion, therefore, the incandescent gas installation at present provided in the Art Gallery is to be preferred to the arc lamps, which are much less effective in promoting ventilation.

The installation here referred to consists simply in the adaptation of Strode sun-lights to incandescent lighting, by substituting for the burner jets a ring of Kern burners, placed close enough together to light each other from one or more bye-pass jets supplied independently. The lighting effect is brilliant in the extreme; and Mr. S. R. Barrett, the Superintendent of the Fittings Department of the Corporation, is to be congratulated on the result.

I look forward with confident hope to a great extension in lighting and ventilation by gas; and instead of taking a second and lowly place, as predicted by our friendly rivals, who generously concede to us a little room for cooking and heating, and perhaps the ventilation of sewers (although the latter will be mentioned with bated breath now, lest the air sewage of the "Tupenny Tube" be remembered), we will yet live to see the ideal dwelling-house lighted and efficiently ventilated by gas, and at a cost that will be simply unapproachable. Then will dawn the day when the sulphur clauses will be eliminated from the General Acts, and the People and Parliament, and even the Chemists of the London County Council, will remember that, even from the earliest days of our industry, gas never was intended as an article of diet, nor the products of combustion as a substitute for mountain air, and that it is the wish and desire of the gas engineers of this country to send the products of combustion, together with the more baneful products of respiration, up the ventilating flues and chimneys of our dwellings, rather than into the lungs of the London Referees, or remain in the vivid imaginations of electrical enthusiasts.

In the Presidential Address delivered by Mr. Charles Hunt in 1878, the probable effect of the introduction of electric lighting on the gas industry was duly considered; and it was boldly prophesied that in the onward march of the years the gas industry had nothing to fear. The prophet still lives, and the prophecy is not dishonoured; and with your permission I will give that prophecy another 25 years' start, and leave to my successor who shall occupy the chair on the completion of the Jubilee of the Association the pleasurable task of still handing it on.

Cyanogen Recovery.

The pages of the Technical Press have of late contained articles on the recovery of cyanogen from coal gas by processes which, however beautiful, are complicated, and involve considerable chemical knowledge in their manipulation. The credit of evolving a process applicable to every gas-works which is so simple in operation that any workman can perform the very small amount of labour required, and make the tests necessary to prove that the operation is efficient and successful, is due to the British Cyanides Company, Limited, whose process it is, and whose head-quarters are at the alkali works of Messrs. Chance and Hunt, of Oldbury.

* See "Journal" for July 29, 1902, p. 276-77.

When, in 1890, I had the honour to bring to your notice the beautiful process of Messrs. Chance Bros. for the recovery of sulphur from alkali waste, it was not thought probable that the process would be of any direct value to the gas manufacturer; and yet, strange to relate, were I to go into an historic account of the materials necessary for the recovery of cyanogen—hitherto a waste product—I should have to give you a short recapitulation of my old paper, as the essential ingredient for the cyanogen recovery is the recovered sulphur of the previous process.

Solid sulphur, in granulated form, is added to a rotary washer, into which has been run strong ammoniacal liquor of $5\frac{1}{2}°$ to 6° Twaddel. The sulphur is dissolved, and unites with the ammonium sulphide ($Am_2 S$) in the liquor to form ammonium polysulphide ($Am_2 S_2$); thus—

$$S + Am_2 S + Am_2 CO_3 = Am_2 S_2 + Am_2 CO_3.$$

The whole of the necessary arrangements are now complete, and the hydrocyanic acid in the gas is absorbed by the ammonium polysulphide ($Am_2 S_2$), forming ammonium sulphocyanide (Am. CNS) and ammonium sulphide ($Am_2 S$), liberating carbonic acid and water; thus—

$$2 Am_2 S_2 + Am_2 CO_3 + 2 HCN = 2 Am CNS + 2 Am_2 S + CO_2 + H_2 O.$$

The liquor is worked up to 18° to 20° Twaddel, when it is run off into a store-tank, and subsequently into railway tank waggons, for despatch to the chemical works. The average yield of ammonium sulphocyanide (Am CNS) is about 4 to 6 lbs. per 10,000 cubic feet of gas; and the value to the gas company is about 2d. to 3d. per ton of coal carbonized.

The sulphur is added to the washer while at work by means of a short tube and full-way tap fixed to each section of the washer. Above the tap is a cup, with close-fitting lid. To charge the section with sulphur, the tap is shut, the cap removed, and the cup filled with sulphur. Replace the cap, open the tap, and the sulphur drops into the washer. Close the tap and repeat.

In order to keep the washer in proper condition for the absorption of cyanogen, it is only necessary to run off a little of the strong liquor, to which add a little dilute acid, when a yellow precipitate proves the presence of the polysulphide. If there is no precipitate, then more sulphur is required. The method of testing coal gas for cyanogen authorized by Mr. Horace Crowther, F.I.C., F.C.S., the courteous Head Chemist of Messrs. Chance and Hunt, to whom I am indebted for the details of the process and for the samples on the table in illustration, is as follows:—

Testing Coal Gas for Cyanogen.

Take two bottles of 250 to 300 c.c. capacity, and place in each 100 c.c. of ammonium polysulphide, containing 5 to 7 per cent. of ammonia, provided with inlet and outlet tubes. The inlet tube should end in a bulb with two or more small perforations, or some similar device to divide the gas. Pass the gas to be tested through this solution at the rate of 1 to 2 cubic feet per hour, and pass at least 3 to 4 cubic feet—better allow to run twenty-four hours. Measure the quantity of gas after passing through the test solution. After the passage of the gas, make the solutions in the bottles up to 500 or a 1000 c.c., whichever is most convenient; take an aliquot part, which should be equal to at least 1 cubic foot of the gas passed. Just acidify with dilute sulphuric acid. Heat preferably by placing in boiling water for 10 minutes or so, to drive off the bulk of the sulphuretted hydrogen; afterwards add a little carbonate of lead, or white lead, to remove the last trace of sulphuretted hydrogen. (If the solution has been made too acid, which will be shown by a brisk effervescence on the addition of white lead, neutralize or make faintly alkaline with ammonia before further addition of white lead.) Just boil, filter, and wash. To the filtrate and washings, add a solution of sulphurous acid and sulphate of copper, both in excess; boil, filter, and wash.

Remove the precipitate of copper sulphocyanide, together with the filter paper, to a beaker (preferably the same one as was used for the precipitation of the sulphocyanide of copper), add a little boiling water, and 25 to 30, or even up to 50, c.c. normal caustic soda solution, boil, constantly stirring, again filter and wash, until washings are free from sulphocyanide, cool filtrate and washing, add dilute nitric acid and a few spots of ferric sulphate solution, then titrate with decinormal solution of silver nitrate until the red colour has disappeared, adding, if necessary, a little more ferric sulphate.

In gases after treatment, or gases containing only small quantities of cyanogen, larger amounts are, of course, taken. The following is an example of an actual test: Gas passed during twenty-four hours, 23·5 cubic feet. Made the solutions in the test bottles up to 1000 c.c. Took 50 c.c., or 1-20th, just acidified, heated, added a little white lead, filtered, and washed. To filtrate and washings, added solutions of sulphurous acid and copper sulphates, both in excess, brought to boiling, filtered and washed. Took precipitate and filter paper and put into beaker, added a little boiling water (about 50 c.c.) and 30 c.c. normal solution of caustic soda, boiled, constantly stirring, filtered, and washed. Cooled filtrate and washings, added to excess dilute nitric acid (1 to 5) a few spots of ferric sulphate. Titrated with $\frac{n}{10}$ silver nitrate solution until red coloration disappeared; at the end, added a little more ferric sulphate, to see if it gave any further red coloration.

$\frac{n}{10}$ Ag No. 3 = 32·7 c.c.

32·7 × 0·0076 = 0·24,852 grammes AmCNS (ammonium sulphocyanide).

0·24852 × 20 = 4·9704 grammes AmCNS per 23·5 cubic feet.

4·9704 × 10,000 cubic feet + 23·5 cubic feet = 2115 grammes ammonium sulphocyanide per 10,000 cubic feet.

2115 rammes = 2·115 kilo. grammes.

Then 2·115 × 2·2046 lbs. per kilo. = 4·663 lbs. ammonium sulphocyanide per 10,000 cubic feet or ton of coal.

To prepare ammonium polysulphide for test, take ordinary sulphide of ammonium, and allow to stand over sulphur for twenty-four hours, with occasional shaking.

On several occasions, a marked diminution in the bisulphide of carbon in the gas has been found when this process was in use, amounting to, in one instance, 43 per cent. of the total present. The results, however, in this respect have not been uniform, although in no case was an increase of the sulphur compounds detected.

RESULTS AT RUGBY.

I have already stated that, after an interval of eight years, I escaped from the nightmare of an over-capitalized undertaking, and entered on the service of a Company with practically an identical output of gas, but with a capital of £38,901, as against £81,200. Here, then, was a splendid opportunity for "an unspeakable Scot," who had crossed the "border" and was "working South" (looking, of course, for a Marshal's *bâton*) to establish an up-to-date reputation on the cheap. My lesson, however, had been too painfully acquired to be forgotten; and I propose to give you, in a few words, the comparative figures of my first and tenth years' labour in Rugby.

COMPARATIVE FIGURES FOR 1892 AND 1902.

On the 31st of December, 1892, the state of affairs was as follows.	On the 31st of December, 1902, the state of affairs was as follows.
Of the £37,500 original capital, £7598 10s. had not been called up. This capital was entitled to a standard dividend of 10 per cent., with gas at 3s. 8d. per 1000 cubic feet.	Of the £37,500 original capital, the whole had been called up.
No issue had been made of the additional capital of £22,500, which would be entitled to 7 per cent. dividend, with gas at 3s. 8d. per 1000 cubic feet.	Towards the end of the year, 215 shares of £10 each were sold . . . . . £2150 0 Premium obtained . 2787 10 £4937 10
Both classes of capital are subject to the sliding-scale; but the additional capital is also subject to the auction clauses.	
The loan capital amounted to £9000.	The loan capital amounted to £9000.
A dividend of 11 per cent., free of income-tax, was paid on the original capital called up for 1892.	A dividend of 13 per cent. per annum, less income-tax, was paid on the original capital. A dividend at the rate of 10 per cent. per annum, less income-tax, was paid on the additional capital.
The unappropriated balance in the profit and loss account was £4627 16s. 6d., subject to one half-years' dividend, amounting to £1644 12s 1d.	The unappropriated balance in the profit and loss account was £6616 os. 10½d., subject to one half-year's dividend, amounting to £2335 10s. 11d.
Insurance Fund. Fund in Consols £980 16s. 7d.	*Insurance Fund.* Funds in Consols, £1620 1s. 9d.
Reserve Fund. Corporation stock . . £2470 5s.	*Reserve Fund.* Corporation stock, £3383 16s. 1d.
Coal carbonized . 7267½ tons.	Coal carbonized . 10,810 tons.
Gas sent out . 73,680,000 cu ft.	Gas sent out . 113,042,000 cu. ft.
Gas sold per ton . 9296 cu. ft.	Gas sold per ton . 10,118 cu. ft.
Coke used per cent. on make, 36·8 per cent.	Coke used per cent. on make, 18·7 per cent.
Unaccounted-for gas 6·8 per cent.	Unaccounted-for gas 2·9 per cent.
Coke sold per ton . . 5·9 cwt.	Coke sold per ton . . 9·8 cwt
Total number of retorts, 84.	Total number of retorts, 84.
Not in use on day of maximum make, 10.	Not in use on day of maximum make, 5.
Price of gas, 3s.	Price of gas, 2s. 8d.

The unaccounted-for gas has been under 3·5 per cent. per annum for the last eight years.

The forked coke sold by weight has been equal to 9·8 cwt per ton of coal carbonized for the same period.

The gas was reduced 2d. per 1000 cubic feet in 1895, and a further 2d. in 1896. As we allow a discount of 2d. per 1000 cubic feet for prompt payment, and a slightly lower price on contracts, the net price for the gas supplied in 1902 was 2s. 5d. per 1000 cubic feet.

The price of gas was not raised in 1893-4 as a result of the prolonged coal strike. No increase in the price of gas was made to cover the excessive cost of coal, by which so many gas undertakings were seriously affected during the past three years, nor was the balance of the profit and loss account drawn upon to make good any loss.

During the whole period covered, no call has been made on the insurance or reserve fund.

20s. has not been spent on capital account on the retort-house.

Forty million cubic feet more gas was made in 1902 than in 1892, and only five additional retorts were in use, each 9 ft. 3 in. long by 22 in. by 16 in. ⏀ section.

The increase of gas sent out for 1902 over 1901 was 11,337,200 cubic feet, and 11,200,000 cubic feet was the increase of gas registered by meter.

I do not put these figures before you as anything very wonderful, but to point out that I have gradually absorbed the £7598 of the original capital, bearing 13 per cent. dividend, and am now extending my works to meet the growing demand, with capital which will entail a charge of a little over 4 per cent., owing to the amount of premiums obtained under the auction clauses.

The Requirements of the Gas Industry.

There are two types of men that are vividly impressed on my mind as indicating the past and the present in the gas industry. The first is the "practical" man, whose only claim to the title was his absolute ignorance of every principle underlying the varied work of a gas undertaking, but who, happily, is dying out, by reason of the general advance in knowledge and the necessities of the times. The second is the expert chairman, who is but blossoming into view by the advocacy of one high in authority, and whose opinions on most, if not on all, occasions, and at all times, we delight to honour. As the advocacy of such an appointment is placed before us as a requirement of the industry, I take it that the matter is one which may fairly be discussed, and from more than one point of view. My point of view is that the successful propagation of this idea, until it arrived at full fruition, when a technical chairman became a recognized part of every gas undertaking, would not only be inimical to the industry as a whole, but, in view of the desire, so often expressed, to induce men of higher technical ability to enter the profession of gas engineering, it is (or appears to me to be) both illogical and absurd. To lower the status of an office is not to add to its lustre; and I am quite unable to reconcile the appeal for younger and better men with a proposal which would stultify every laudable ambition, and rob the occupier of that office of the credit of his work.

In a recent article in the Technical Press, the writer, referring to this proposal, asserts that "a few people in the gas industry have assured us that they are sick of hearing and reading about him [Sir George Livesey] and his doings. No doubt, and for very good reasons; but they are of a very small minority." I would be very sorry to misinterpret the meaning that the last sentence may have been intended to convey; but I assert that if it was intended to imply that opposition to this proposal could only arise from those who had some mean, unworthy, or sordid motive for their opposition, the statement is surely unjustifiable. But if, on the other hand, we are to take it that a few may have good reasons for opposition, but that they are in a very small minority, then I challenge the statement with all the vigour of which I am capable. Unless we have arrived at such a parlous condition of affairs that we must accept as an axiomatic truth that a man's honour can only be estimated by the capacity of his gasholders, and his moral worth inversely as his distance from London, there will be absolute unanimity in the opposition to this proposal throughout the length and breadth of the land, and from every man who has any sense of honour or self-respect, or who has the best interests at heart of the men on whom the success of the industry depends.

I have the profoundest feelings of respect and admiration for Sir George Livesey. His life and practice present to me the ideal that every man may emulate to his greatest good; and there is but one sentiment among the gas engineers of this country in regard to the hope expressed that he may long live in active work to adorn the profession to which he has devoted his life. Nevertheless, when the time arrives (which, I hope, may be far distant) when he relinquishes the reins of office, I express with all my heart the hope that the expert or professional chairman may become as extinct as the "dodo." And while I am proud to know and think that Sir George is almost idolized among gas engineers throughout the world, it will, I am profoundly convinced—and I speak in all sincerity—require but a little further extension of this proposal to convince an unwilling and indignant industry that its idol has fallen from its place. One swallow does not make a summer, nor will two or three expert chairmen make an industry; and I ask you to turn your minds to a higher level of thought, suggested by the words of Sir Frederick Treves, who, in opening a new operating theatre in the South of England a few days ago, remarked "that it was a small matter that there should be three brilliant surgeons, but it was a very important matter that there should be three hundred!"

The Need of the Industry.

What, then, is the present-day need of the gas industry? I answer, three hundred or three thousand more highly qualified and better technically educated men. How are they to be obtained? How? By the American method of "scrapping" and the introduction of better, because more recently educated, youths under the protecting care of expert chairmen, who will, of necessity, take from them the credit of their work? Surely not; but by the spread of technical education and by increasing the facilities for acquiring it. What has been done in the past for the technical education of the gas engineer? Well, there was the examination in gas manufacture under the City and Guilds of London Institute, which was the only means of testing one's knowledge, or which could in any way promote or suggest consecutive study on the subject. It is not so long ago since the questions put to the candidates were so extremely ancient that to pass successfully one had to borrow books that were out of print in order to learn of the doings of a gas company which had ceased to exist. But, thanks to a persistent Press, and to the appointment of examiners who set questions belonging to the generation in which the student happened to be born, a great improvement in this examination has taken place; and I cannot too highly commend the assistance given to the young men in the industry by the Press in this matter.

Then we have, of course, the technical associations and institutions of the country. Will any sane man dare to assert that the highly-educated and technically-trained man is to be produced from this source? Will not a scrutiny of the proceedings of any and every technical society reveal the fact that a great portion of its proceedings ought never to have appeared in the records at all, but should have appeared in the advertising columns of the Press? Herein lies great "waste," which I am sure the editors will be delighted "to recover," to their material advantage. The teaching power of a technical society cannot supply the needs of the industry unless conducted on lines altogether different to those now prevailing.

What source for producing the men required remains? The greatest source of technical information and instruction available is to be found in the Technical Press; and I gladly pay my tribute to its vitality and power. I do not know whether it is the fact that any marked development has recently taken place in our Technical Press, or that I have but lately given it adequate attention, but the fact remains that it has been a great source of trouble to me. To a man of limited experience and but slightly varied gifts, the endeavour to compose an address to colleagues, many of whom have had infinitely greater experience, is no light task; but the difficulty is intensified when from week to week you discover that every subject under the sun that you know anything about or can think about is adequately dealt with, and in sweet flowing language that you cannot command, and with an attention to style that is unapproachable. I am convinced, however, that journalistic technical teaching will never produce the men required, because of the immensity of its kangaroo-like jumps in opposite directions.

For some considerable time now the Press of this country has been energetic in its advocacy of "the up-to-date;" so much so that it is simply useless to expect anything more than a second-class railway fare when applying for a fresh appointment, unless you can reply in the affirmative to the stern inquiry, "Do you make water gas?" and "Are you a sloper?" But two great men devote their speeches to their shareholders to the evils of over-capitalization, when, hey! presto! the journalist comes out with a flaming article on the unwisdom of indiscriminate capital expenditure and the extremely great merit of keeping it low. And although on another page you may find a splendid article on the "Dilemmas of a Gas Engineer," you cannot fling your own plant down a pit, or get your money back if you did.

Who is to Blame?

Who, then, is to blame for the fact, if fact it is, that the need of the industry is the want of more highly-trained and better technically-trained men? Why, who but the experts of the industry, who have been content to batten on an ignorance they have done little or nothing to remove. Who but the gas companies and corporations controlling millions upon millions of capital, who have been supine and indifferent to the welfare of their employees and to the proper mental equipment of the workers on whom the success of the industry depends? And who but the Government of this country, which is only now waking up to a sense of responsibility for the technical education of the people, and to its paramount duty of placing within the reach of its meanest citizen the means whereby he may rise, by his own labour and merit, to the highest point in the industrial and intellectual scale. Let us see to it, then, that we individually and collectively do what we can to remove the reproach so unsparingly inflicted, by seizing every opportunity to improve our knowledge and keep up to, and in advance of, our day, if that be possible, for

> The moving finger writes, and having writ,
> Moves on; nor all your piety and wit
> Can lure it back to cancel half a line,
> Nor all your tears wipe out a word of it.

Votes of Thanks—The Question of Qualified Gas Directors.

Mr. Hunt said he rose with very great pleasure to propose a cordial vote of thanks to the President for his most practical and most eloquent address. He (Mr. Hunt) had listened to it with a great deal of pleasure; and he was sure that everyone in the room must have done so. There was much in it by which they could profit, though they might not agree with the President on all points. There was an unwritten law which precluded them discussing presidential addresses. Perhaps, however, he might be excused for saying there was one point on which he cordially agreed with the President; but there was another point on which he disagreed. The point on which he agreed was in the tribute he had paid to the Technical Press. The service it had rendered to the industry in the past was incalculable; and, for the sake of that service, they could excuse an occasional veering of opinion. The point on which he disagreed with the President was when he referred to the proposal for the appointment of expert chairmen. He had from the first thought that, for the younger generation of gas men, there was the possibility in it of opening out a new and a very fine career. To the older men, it was of no particular interest; but to the younger generation he said it was something to aspire to, and he certainly thought it was a step in the right direction. Their President remarked upon the inutility of having two or three such chairmen; but he (Mr. Hunt) would point out to him that every step of the kind must have a beginning; and before they could have 200 or 300 expert chairmen, they must have two or three. He had very great pleasure in

proposing a most cordial vote of thanks to the President for his address.

Mr. R. O. PATERSON (Cheltenham) seconded with very great pleasure the vote of thanks to the President for his most interesting address. He had never yet been quite able to settle in his own mind, and certainly he had not had the question answered from the address itself, whether their President was a worthy countryman of his own, or whether he came from the other side of the Channel. He thought there was in the President a good deal of the spirit of that racy nationality which gave them so much breezy discussion sometimes in parliamentary reports; and he thought he could compliment the President upon the very eloquent expressions with which he had clothed the subjects of his address. A matter upon which he would like to just throw out one hint before sitting down was that, although he agreed with a great deal in the address, he too felt that the President had somewhat missed the mark of the question as to the expert chairmen. Eloquent and racy as the latter part of the President's address was, he thought he rather misapprehended the true point of Sir George Livesey's opinion on this subject. He did not think that it was ever Sir George Livesey's intention that the expert chairman should take the place of the engineer; and he (Mr. Paterson) thought, though it could only be in certain undertakings where the expert chairman would ever be a power in the management of the undertaking, still he believed it would be for the general good if in large gas undertakings the chairmen were men of experience. It was impossible to conceive what might have been the position of the gas industry at the present day if they had had half a score or a score of George Liveseys. He thought their admiration for Sir George would debar them, for even a moment, suspecting that he had any intention of lowering the dignity of the gas engineer by any proposition he had to make. He was sure he had no intention of conveying that meaning, though perhaps his remarks had rather led some to that opinion. Their President declined to consider himself one of the young members, although the appearance of his face rather inclined him to doubt his word. He (Mr. Paterson) looked forward to the President's year of office as the beginning of a new era in the history of the Midland Association. The old men had had their day; and among the members they had many capable men like their President who were only waiting, he hoped, to succeed him in his office.

The resolution was heartily agreed to.

The PRESIDENT said he was extremely obliged to Mr. Hunt and Mr. Paterson for the cordial way in which they had proposed and seconded this resolution, and for the kind way in which it had been endorsed. He did not expect that Mr. Hunt would agree with his opinions about experts. (Laughter.) However, he felt just as convinced at that moment, because, however haltingly he might express his opinion, he never expressed his opinions without having given them good thought. Whatever the intention of Sir George Livesey might have been (he did not question that at all), he had the profoundest conviction that it was impossible to have an expert chairman over a gas engineer, and the gas engineer to get credit for the work he did. If members looked into a recent issue of the "JOURNAL," they would find a wonderful result recorded—the expert chairman alluded to as a great success, but the engineer not referred to at all. It must of necessity be so. One thing that puzzled him about the proposal was this, that, when Sir George Livesey referred to the question of the inducement offered to a more highly trained and technically expert class of men to come into the profession, he held out the marshal's *bâton* to them. Now he (the President) could not understand, with regard to the expert chairman and the gas engineer, which was the marshal and which the *bâton*. His opinion was the expert chairmain would be the *bâton*, no matter what sort of marshal he had got. As to his friend's (Mr. Paterson's) references to his country, he would make it quite clear to him. If an expert chairman dared set his nose within the parliamentary limits of the Rugby Gas Company, his (the President's) move south would be immediately arrested; and he would face north. Crossland would be avenged, Bannockburn be forgotten, and he should make tracks for the North. (Laughter.) His pilgrimage would be directed to Granton, and he should use his native eloquence to persuade Mr. Herring to move South in the hope of discovering the marshal's *bâton*, which he (the President) considered a delusion and a snare. "And the burden of my song shall be 'Why left I ma hame?'" (Laughter.)

Mr. THOMAS GLOVER (Norwich) proposed a vote of thanks to the retiring President; remarking that no words of his were needed to support the proposition. They were delighted to see Mr. Hunt with them that day; and he was there to receive their thanks for his past year's work. They were glad when they found he was able to take office, and they were pleased that he had been in a position to devote himself once again to the work of the Association.

The PRESIDENT said he had much pleasure in seconding the proposition. He did it with a very sincere heart, realizing how very much the Association had been indebted to Mr. Hunt through the whole course of its career. He hoped that Mr. Hunt would be long spared—expert though he be—to favour them with his good advice and opinion from any quarter in which his labour might be devoted, and that they might often have the pleasure of seeing him among them in the years to come.

Mr. HUNT said he felt very grateful to the members for this kind vote of thanks, and the kind expressions which had accompanied it. This vote came rather unexpectedly to him, because he thought, after the last meeting in October, that their goodness had exceeded all that he could have deserved. He felt his thanks were due for the great support he had received from every member of the Association, for the great experience—which he was able to avail himself of—of their esteemed then Vice-President (Mr. Meiklejohn), and for the able assistance of their Hon. Secretary. He wished also to acknowledge the kindness of those who had furnished papers for discussion during his year of office, and express the hope that his successors in the chair might be in like manner supported by the members. Neither ought he to forget to mention the important contribution which Mr. Maybury and the District Council of Malvern made to their proceedings. He was sure that without the visit to Malvern the proceedings of the year would have possessed much less interest. He (Mr. Hunt) thought he should also take this opportunity of thanking the members one and all for the very great kindness he had always experienced from them throughout the whole term of his connection with the Association. He felt that he owed a great deal to the Association, and to Associations such as this. He owed to them instruction; he owed to them some of his most valued friendships; and he owed to them some pleasant, if brief, respites from the anxieties and (might he not say) the vexations of official duties. Here at these meetings, whatever might happen elsewhere, one was sure of a generous appreciation of one's aims and objects whether acceptable or otherwise. It was hardly likely that he could be so regular in attendance at these meetings in the future as he had been in the past; but whatever might happen they would always be to him a pleasing recollection. They knew what Shakespeare had written—

> The friends thou hast, and their adoption tried,
> Grapple them to thy soul with hoops of steel.

"My friends," he said, in conclusion, "I can say your adoption has been tried; and, believe me, there is a bond between us that cannot be lightly broken."

This concluded the business proceedings; and shortly afterwards the members had tea together.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 649.)

There was a change for the worse last week on the Stock Exchange. Business fell very quiet indeed; and although at the start one or two lines—notably Consols—were buoyant, a degree of dulness rapidly set in, and everything almost without an exception fell quite flat. Prices throughout the list exhibit a more or less considerable falling off—Railways of all sorts being conspicuous in the shrinkage. Money was in good demand, and the market was very firm; rates, both for short loans and discount, keeping a good level. Business in the Gas Market showed a great improvement; the volume of transactions being considerably larger than any for some weeks past. By far the greater portion of them were done in the biggest issue; but, apart from this, the aggregate was assisted by dealings in some stocks which are not frequently brought into notice. The general tendency may be pronounced as steady and firm. Changes in quotation were remarkably few, and were entirely confined to issues which as a rule go on month after month without alteration. In Gaslight and Coke stocks, there was great activity in the ordinary; and it was not devoid of interest. After marking $84\frac{1}{2}$ on the opening day, it began to droop, and fell so out of favour that on Thursday it changed hands more than once at 82. But then the pendulum began to swing the other way, and on Saturday the price was back to $84\frac{1}{4}$; so there was no harm done. There was a fair amount of business in the secured issues too, and mostly at good, steady middle figures. South Metropolitan was only moderately active. The price was rather inclined to jump about, and the tendency was not very clear or very pronounced. The quotation, however, closed unchanged. Only one or two bargains were marked in Commercials, at easy figures. The Suburban and Provincial group came in for more attention, and produced most of the changes recorded in the week. Crystal Palace preference was put up, and the ordinary was put down a couple of points; and Tottenham "B" had an equivalent advance. A fair amount was done in the Continental Companies. European marked top price, and looks like rising. Imperial also showed well; but Union made no sign of recovery. Among the remoter undertakings, River Plate had a rise. The Water Companies were quite devoid of feature; and there was no change in any of their quotations.

The daily operations were: Gas was rather quiet on the opening day, and remained steady throughout. Tuesday gave better promise of activity. Crystal Palace preference advanced 2; but the ordinary fell to an equal extent. Wednesday was an active day. Gaslight ordinary was flat, and fell 1. On Thursday, there was much dealing in Gaslight ordinary, which continued flat. Tottenham "B" rose 2. Friday was fairly brisk, and Gaslight began to steady; but quotations did not change. Saturday was a quiet day, with better prices. Gaslight ordinary rose 1.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Thirty-third Annual Meeting of the Institution was held last Saturday, at the Mosley Hotel, Manchester. There was an excellent attendance of members. At the commencement of the proceedings, the retiring PRESIDENT (Mr. Arthur Graham, of Mansfield) occupied the chair.

The HON. SECRETARY (Mr. R. G. Shadbolt, of Grantham) read the minutes of the last meeting; and they were confirmed.

ANNUAL REPORT AND ACCOUNTS.

The Committee's report and the accounts were next submitted. The following are extracts from the former:—

The year has been unique, inasmuch as it has witnessed a reconstruction of the rules, including the adoption of the ballot at all elections, and the inaugurating of a commercial movement, as distinct from purely technical objects. Your Committee would take this opportunity of impressing upon the members the advisability of giving this movement a fair trial, and their loyal support. The operation of the new rules disposed of the election of officers, members of Committee, new members, &c., at the Bradford meeting, with the minimum loss of time, and leaves practically the full time of the annual meeting for the transaction of technical business, of which the Committee trust the members will fully avail themselves.

The membership roll continues to extend, comprising 155 members. Death has claimed two of our old members in the persons of Mr. Robert Bridge, of Doncaster, who has been a member since 1879; and Mr. W. R. Chester, of Nottingham, who joined the Institutton in 1882, and has occupied the presidential chair. Three members have resigned, one has adopted another calling, and one ceased membership under Rule 14; while, on the other hand, 11 new members have been added to the roll.

Your Committee note with pleasure the increasing vitality of the Institution, and the growing desire of the younger members to participate in the responsibilities as well as the privileges of membership. This augurs well for the future success of the Institution, which they feel will be even greater than that in the past.

Regarding the accounts, including the balance brought forward, the income amounted to £113 16s. 11d.; and, deducting expenditure, a balance of £33 10s. remained.

The PRESIDENT, in proposing the adoption of the report and accounts, said he had been rather afraid, from the successful year they had had, that the difference between the balance brought forward and the balance in hand would have been more than it was. He was glad to see there was only a variation of £3. He should like to see the item "outstanding subscriptions, £10," entirely wiped out.

Mr. W. SEVERS (Wilmslow) seconded the motion, which was unanimously carried.

The PRESIDENT said the next business was the induction of their new President—Mr. S. R. Ogden, of Blackburn. (Applause.) He was sure that in Mr. Ogden they would have a very good President. On looking at the list of members, he (Mr. Graham) saw that their new President had been connected with the Institution for above nine years. He trusted that his year would be a very successful one.

Mr. OGDEN then took the chair amid applause; and, without delay, at once read his

INAUGURAL ADDRESS.

Gentlemen,—Allow me, on this my first opportunity, to thank you most heartily for conferring upon me the honourable and distinguished position of President of this Institution. Knowing the many able and distinguished Presidents who have preceded me, and who have left a high standard to maintain, I feel a considerable amount of diffidence in accepting such a position; and, while acknowledging my unworthiness, I shall leave nothing undone within my power and ability to uphold and maintain that standard of excellence and the prestige of our Institution.

Having heard the annual report read, we may congratulate ourselves on the soundness of our position, and of our vitality shown by the excellent and interesting papers read during the last year, and the instructive discussions thereon. It is with pleasure I note that the authors of some of the papers are among our younger members; and I should like to congratulate them on the manner in which they placed their subject-matter before us, and trust their example will be followed by others during the coming year, as it is to this body of our members to whom we must look for a continuance of our life and animation.

The two papers given at our last meeting, on the adoption and development of incandescent gas lighting in all its forms, are on the most interesting subjects of thought and attention with us at the moment. It cannot be denied that great strides have been made during the last twelve months in showing its adaptability to many industries which were then thought to be almost impossible. The development of high-pressure lighting for open spaces, market halls and squares, important street crossings, workshops, &c., is very marked. The excellent and effective results obtained, at a moderate initial cost and upkeep, give it an easy first position over any of our competitors; and that it is recognized as such, is shown by its adoption in our large engineering works (in extensions of lighting required), and in some cases in substitution of electric lights already installed. That this system cannot, except at a very heavy initial cost, be adapted generally for street lighting, is unfortunate, as its economy and general effectiveness stamp it as most suitable for the purpose.

We have, however, a good substitute in the self-intensified lamps, which are equally efficient; but they are made in such sizes at present as to debar their use, except for very special purposes. Given a series of lamps of greater variety in the effective use of smaller quantities of gas consumed per hour, and in a correspondingly cheaper lantern, this system, I think, would be readily adopted for street lighting generally. It is, however, satisfactory to find that street lighting with ordinary incandescent gas-burners is gradually being extended; and, on the other hand, surprising yet to see the tardiness with which many authorities accept this system, especially after the many fine examples of town lighting which may be seen by visits to such cities as Liverpool, Manchester, Bradford, Leicester, &c., and after opinions openly given by those well able to judge, of its better efficiency, cheapness in first cost of installation, and greater economy in upkeep. Better testimony cannot be given than in the case of Liverpool (where they have to purchase the gas used from a private Company), owning as they do the electric supply.

We have now many of our industrial works illuminated by this means; and the paper given at our last meeting on the lighting of woollen mills was one calculated to push forward and extend its further use. That it can be used with success in woollen mills, where the conditions would certainly appear against it, and also in our cotton mills, where steaming the air and similar conditions abound, is assured. In Blackburn, many mills have introduced this means of lighting with great success. The method in vogue is that of fixing a No. 4 incandescent burner, with anti-vibrator attachment and tin shade, in place of two ordinary lights over four looms. Those of you acquainted with the fitting up of gas-piping in a weaving shed, will know that in the centre of each alley a main-pipe is run overhead with a pipe dropped down in the centre of each four looms, and branches taken each way, for a single light to illuminate the cloth being woven on two looms. These branches are taken out, and the incandescent light suspended on the down pipe, which brings the light exactly in the middle of the four looms, and immediately over the gearing actuating the looms, but from 3 to 4 feet (in some cases more) from the centre of the cloth being woven at each side of it. This, as you will see, although the light obtained is much better, is not desirable, as the best distribution of the light cannot be obtained at the point most required.

A millowner I advised on the matter has adopted an incandescent burner for burner throughout his shed. He uses a No. 3 Kern burner, with anti-vibrator, and a cheap enamelled shade, with the result that the light is remarkably well distributed over the centre of the looms, and is giving great satisfaction to both the workpeople and the master, particularly where coloured or fancy goods are being woven. The latter method, it is hardly necessary to say, is the more costly—being about double the former; but I think it will be more durable, and in the long run be the better investment. The saving in gas is, in the former case, 60 per cent., while that of the latter is from 46 to 50 per cent.; but the effect produced by the latter is much to be preferred. This method has been introduced at two other of his mills, with the result that he has now some 1080 burners in use, which, during the nine or ten weeks they have been working, have only required some 70 mantles renewing—several of these having been broken by being knocked off. This lighting effect has been seen by a number of other millowners in the town; and I anticipate that another year will see a large increase in the number of mills so illuminated for the winter season.

The steady increase in the lighting by incandescent burners in our streets and places of business is educating our working classes to the advisability of utilizing the same means in their homes, and creates a good influence towards its adoption, as workpeople do not as a rule care to have a worse light in their homes than that in which they carry on their daily avocations. Evidences, however, of decreased consumption in such cases are sufficient proof that they are taking the advantages it offers; and many evidences of pleasure have been expressed, by the use of a cheap form of burner attached to a prepayment meter, not only as to the better light, but more especially to the extra hours lighting that can be had for the penny inserted therein. That this method of lighting may become more universal is very desirable, as, by its means, a better use (not abuse), of our commodity must accrue, resulting in a greater appreciation both of gas, and of all parties connected with its manufacture and supply.

It may not be out of place here to mention a new petrol incandescent light, which was seen on a recent visit to the exhibition at Dusseldorf. It is called the "Washington Light," and is obtained by applying, by a hand pump, a pressure of 60 lbs. to the square inch, on the petrol in a cylinder, which forces it to the incandescent burner and mantle; the result and effect being very conspicuous. It is, as you will see from the above, essentially a high-pressure petrol light; and from what little literature could be got and little information to be obtained, owing to there being no interpreter in attendance, I have culled the following figures. I cannot, however, check them as to what they would be if worked out on English figures of cost, &c. The consumption of petrol is given at the rate of 180 grammes per hour, producing a light equal to 500-candle power; while the working

expenses are given as ⅔d. per hour, as against 1·25d. for incandescent gas lighting. It would therefore appear to be a remarkably cheap and effective light; and I am sorry that a better comparison cannot be given. My object in mentioning it is only that of making our members acquainted with the fact that, as a light, it may become another competitor of its series.

While we are welcoming the advent of a more universal system of incandescent lighting, we must not forget, or lose sight of, our other approaching and dangerous rivals. The introduction of large Mond gas plants in the centres of our great hives of industry is a serious menace to the surrounding gas companies and local authorities; and though experience has proved that it requires not only some four or five times the quantity of this gas to do what a given quantity of coal gas will do, but much more attention and cleaning of the engines and motors used, owing to its impurities, yet the price they offer to supply at is so low that to meet it large reductions in prices will have to be made in order to keep our customers. No doubt our large corporations and companies, when the time comes, will be able to make the reductions necessary; and, speaking generally, it would be gratifying to all gas engineers to see the former doing this, to the detriment of the present unfair practice of paying large sums to the relief of the rates from their profits.

Then, again, take the many gas-producers which are being made and sent out with gas-engines of all sizes. Only recently we find that a large order is being carried out for such a producer to supply gas-engines of 1000-horse power, which, to any of us, would mean a nice quarterly account. There are also the various oil and other gas engines, being made to work by all sorts of waste gases, which show the tendency of the present day for cheaper fuel, and consequent less cost of working. Some of the latter means of actuating gas-engines are not direct competitors with us, and are for the purpose of utilizing gases which are, of course, at present going to waste; in many cases thereby obviating a nuisance. It is, nevertheless, necessary for us to keep these objects well before us, and try at any rate, if not to replace them with coal-gas driven engines, to see that they do not increase to our own disadvantage. The only means of doing this is by selling our commodity at the lowest possible price.

The ever-increasing use of incandescent burners for illuminating purposes is steadily removing the one object of higher qualities of gas; and it is desirable that we may all be able ere long to recommend our boards and committees to follow the examples of the London Gas Companies and other Corporations in having our standards of quality reduced. Many objections will, however, be met in getting this accomplished, and trouble will be found in proving to our consumers that the lower-grade gas is equally as efficient for incandescent lighting, gas-stoves, cookers, and engines, &c., also, owing to the ideas obtaining that low-quality gas is dirty and not fit for use. It should be our duty to allay these doubts, by proving that the same care and processes will be gone through in manufacturing the gas, and that, by its supply and use by them, much less vitiation of the atmosphere, and considerably less amount of damage to decorations in our homes, will be the result. This, along with a reduction in price corresponding with the reduction in candle power, would assist us all in attaining this object.

Another means of help in reducing our price is that on which Professor Vivian B. Lewes has spent so much valuable time and attention—that of introducing blue water gas along with the coal gas as being made for the purpose of taking up the lighter oils of illuminating value, which are lost by condensation. To him, and all other engineers who have gone into the matter, and who have so generously given the benefit of their experiences through the Press, should our thanks be extended, for showing what can be done with this method. Like all other processes, it demands room and accommodation, special plant, and the having at our disposal a spare gasholder. As the majority of us have, however, none of these necessities, it is requisite that some outlay should be made so that advantage may be taken of this method; and in order to see how far this could be done with the plant at my disposal (being, as you are all aware, in possession of a carburetted water-gas plant, one portion of which is essential to the process), I am introducing blue water gas as it is made by the plant intermittently. To do this, a 3-inch connection was taken from the top of the producer or generator, and carried some 30 yards across the yard, where it is connected with the coal-gas foul main, immediately at the outlet from the hydraulic mains, whereby a travel of some 526 feet of the mixture is obtained before it leaves the outlet of the condensers. The temperature of the blue water gas at the point of admission in the foul main is about 220° Fahr., and that of the mixed gases at the inlet of the condensers about 127° after travelling 200 feet. Before commencing this experiment, our average weekly make of carburetted water gas made, &c. was—

Statement No. 1.

Length of time under observation	6 days.
Quantity of gas made	3,554,000 cubic feet.
,, ,, coke used in generator	1016½ cwt.
,, ,, per 1000 cubic feet made	32·03 lbs.
,, ,, oil used	9844 gallons.
,, ,, ,, ,, per 1000 cubic feet made	2·77 ,,
Total number of runs	549
Average make per run	6474 cubic feet.
Average illuminating power	21 candles.

Giving an actual working of 84¼ hours, with a make of 42,058 cubic feet per hour purified in holder.

During the experiment as follows:—

Statement No. 2.

Length of time under observation	6 days.
Quantity of gas made	2,871,000 cubic feet.
,, ,, coke used in generator	1026 cwt.
,, ,, ,, ,, per 1000 cubic feet	42·02 lbs.
,, ,, oil used	7998 gallons.
,, ,, ,, ,, per 1000 cubic feet	2·78 ,,
Total number of runs	540
Average make per run	5317 cubic feet.
Average illuminating power	21

Giving an actual working of 83 hours 4 minutes, with a make of 34,561 cubic feet per hour.

From the latter statement, it may be inferred (having no meter at our disposal to check same) that the loss in gas made during the two periods is the quantity of blue water gas passed through the coal-gas plant, less the percentage loss from less oil used. The difference in the yield of carburetted water gas per hour is thus 7497 cubic feet, which I assume would be made up as follows:—

34 561	cubic feet	made per hour as last statement.
1,616	,,	oil gas less through decrease in oil used.
5,881	,,	blue water gas passed through coal-gas plant.
42,058	,,	equals quantity made per hour, as Statement No. 1.

Taking this as a basis, we arrive at the conclusion that, with plant working 83·07 hours and passing 5881 cubic feet per hour the total quantity of blue water gas so used is 488,000 cubic feet for the six days, which worked out at the rate per ton of coal carbonized as registered by the coal-gas meters, gives an increase of 560 feet, or taking the hourly make while passing blue water gas with the coal gas, of 9·43 per cent. increase. The effect of the introduction of this quantity of blue water gas for the time being upon the quality of a portion of the coal gas made only, is to reduce it from 17½ to 16¾ candles, and is rather more than one would be led to expect from results as published. This, however, may be accounted for by the intermittent way in which the blue water gas is introduced, and to the consequent irregularity in the working of the exhausters; for while at one time back-pressure is on the hydraulic mains, at another time a greater vacuum than necessary is evidenced, and also by the fact that our tar having a higher specific gravity—viz. 1·20—lighter oils are not so abundant.

The object in making this experiment has been with a view of obtaining some of the advantages others are getting, at a small initial cost. the space at my command will not permit of a gasholder sufficiently large being put down so as to allow of a regular and uninterrupted supply of blue water gas through the twenty-four hours. That we have obtained some advantage is clear, in that our quantity of oil used per week was reduced by 846 gallons, while the cost of the carburetted water gas made is not appreciably increased, and is more than equalized by the corresponding reduction in the cost (owing to the increased make per ton) of the coal gas manufactured, besides the enriching of the blue water gas up to 16¾ candles.

I may here remark that the carburetted water-gas plant during these observations has been run for two shifts of eight hours duration each per day. Allowing from this time an average of two hours per day for clinkering purposes, the actual period of intermittent gas making is only 14 hours, and the actual time of gas making is between seven and eight hours. The effect, therefore, on the quality of the gas caused by the admission during this period of the blue water gas is not very appreciable over the twenty-four hours—certainly not more than ¼ candle when it is thoroughly mixed with the remaining coal and carburetted water gas. Owing to the short period during which these observations have been made, no alteration is apparent of any detriment to the value of the tar.

In bringing the results of these experiments before you, I cannot claim to have gained any great advantages, and am somewhat disappointed in the results. However, as the old adage says, "Half a loaf is better than no bread," I shall continue the method, and intend, by means of larger connections, to increase the quantity of blue water gas so dealt with, with the hopes of better results; and I should be glad to exchange notes with any engineers who are carrying on, or with those who can arrange to experiment, on similar lines.

Having so far confined my remarks to the extension of incandescent lighting, and the further use to which a carburetted water-gas plant may with advantage be put, I should now like to say a few words on the other matters on the commercial side of our business, and shall ask your attention to our new offspring—the commercial department—and express our most hearty thanks to Mr. Meunier, of Stockport, and his colleagues, for bringing this important question forward, and for the indefatigable manner in which, for over two years, they have worked in order to establish on a firm basis the Manchester section. Their experience has proved the feasibility of such a departure, and the advantages to be obtained by being a member thereof. That such a commercial department is unnecessary and against the rules of our Institution is questionable, and probably it does not fall in with the views of a certain section of our members; but until tried, it is equally impossible at this stage to estimate the value of this department, or the number of subjects that may be brought forward with benefit to all.

That the object first mentioned as a necessity for its adoption will not exhaust its sources of information is absolutely assured. The method at present in vogue is that of having placed before each member a weekly statement of coke in stock, local prices of same, contract rates at yard and f.o.r., obtaining at the various works in his section, whereby he is at once given an idea of its market value. Given a faithful and honourable use of such statistics, it should be, and is, possible for all members to get the best value for their coke, without injuring any other member by selling at lower rates than he, and thus obviating unnecessary cutting of prices.

By interchanging information as to inquiries and openings in the coke market, it has also been found possible to assist members to get rid of surplus stocks at much better prices than would otherwise have been realized; and it is by such mutual assistance, together with the information obtained from the weekly returns, that a more uniform value must accrue. The fixing of prices cannot, and must not, be attempted if success is to be achieved; local circumstances alone being responsible for that. Nor is it the intention to interfere in the slightest degree with any manager or engineer making forced sales to clear his stock, when short of storage. But knowing from his sheet of returns the prices obtaining around, and knowing the destination, after deducting cartage and freight rates, he will know the value of the coke when at its destination, and be able to quote accordingly. It cannot be doubted that the lack of this information has caused us all inadvertently to receive and accept on many occasions less than we should otherwise have done for our surplus coke; and a steadfast adherence to the above principles must result in gain to all.

As with coke, so with the many other commodities which come within the scope of the manager's buying and selling. Take, as instances, the many different sliding-scales and methods of disposing of ammoniacal liquor obtaining to-day. It will no doubt be found possible, as the result of discussions at the monthly meetings, and in its main features applicable to nearly all our undertakings, to propound a more satisfactory scale beneficial to all in need of such; so giving better satisfaction to our various boards. There is also a very varied price paid for tar about this section; and while we cannot all expect to receive the same price, there is no reason why (after making all allowances for freight of raw materials to the various tar distilleries), many of us should be receiving prices below the market value. A number of facts and figures have already been collated; and it is intended to further amplify these, so that full information as to sliding-scales in operation, and other methods of disposal, will be available for the guidance of members. These are only the principal commodities we have to dispose of; and to enumerate other advantages that may be and have been obtained in the above section would take up too much of the time at my disposal, but would, I feel sure, surprise many of the sceptical ones.

Taking another side of our manifold duties, what could be more beneficial to us all than a properly and carefully compiled statement, in pamphlet form, showing the wages paid in our various departments of labour? Here we have a field of tremendous range for this department to attack and reduce for our information to comparative figures. We are all at times, in our official capacity, required to obtain statistics from neighbouring towns, as to rates of wages paid, &c.; and it is very difficult indeed to so frame a question that all recipients of same may be able to give you a helpful answer, and it happens of a necessity that the replies are misleading, owing to the different methods used in extracting these figures. A question here might therefore be asked, What comprises the cost of manufacture of gas into the holder? I would suggest that they should consist of the following labour costs:—

HAND STOKING.

Cost of placing coal in position for charging.
" " stokers' wages.
" " removing surplus coke.
" " engine and boiler attendants.
" " portion yard foremen's wages.
" " clinkering (if extra).

MACHINE STOKING.

Cost of placing coal in overhead hoppers, including taking out of store and machinery attendant.
" " working machines.
" " removing surplus coke (including machinery attendant).
" " clinkering (if extra).
" " engine and boiler attendant.
" " portion yard foremen's wages.

INCLINED-RETORT WORKING.

Cost of placing coal in overhead hoppers (as above),
" " stokers' wages.
" " removing surplus coke (as above).
" " clinkering (if extra).
" " engine and boiler attendants.
" " portion yard foremen's wages.

The above items are, I think, those on which the cost of manufacture of gas should be based; and in making up the returns necessary, every engineer should take into consideration his own particular circumstances, and, where the full charges would be excessive, owing to his men doing other duties, make suitable reductions. After having decided the forms of queries under each heading, there would be no great difficulty attached to he filling up of the forms; and if each section were thus taken in hand, a compilation could be obtained which I am sure would not only be ever ready, but it would enable us to make our own particular comparisons without having to send out so many lists of queries for answers, which we are all willing to reciprocate, but which are at times very irksome. This compilation would not only warrant such a departure, but would show our various committees that the work we have in hand is one of usefulness, if not at first apparently remunerative, and would help us in our endeavours to get them to assist us monetarily to carry on this department.

This, I believe, will become one of the first questions on the formation of our various sections; and it is hoped that members will kindly think the matter over carefully, so that in its compilation all departments may be dealt with, and on its completion be of a comprehensive character. At a meeting of the Chairmen appointed over the various sub-sections, it was discussed as to whether the managers of such influential undertakings in the district, who are non-members of our main Institution, should not if possible be incorporated in the sub-section. It was decided that to commence any movement without their co-operation would be courting disaster; and a recommendation to ask your sanction for their incorporation was decided upon, so that they may be elected (where advisable) to the section committees, and thus obtain the benefit of their experience and advice. My object in putting this matter before you to-day is particularly that of inspiring a good feeling towards this movement, when, if the individual assistance of all members is given to it, I hope that at the end of the term of trial we shall find it fixed on a firm basis and growing in importance and assistance. Such a departure, with the results anticipated, will more than justify its existence to all our members, as I am firmly of opinion that in future years it will be of the greatest importance that we bind ourselves more closely together by frequent intercourse, and a ready willingness to help each other by giving, on small as well as large matters, our experiences freely, criticizing in a friendly and fair spirit, and thus helping each other to achieve our objects.

Before closing my address, I should like to express my thanks to the Resident Engineers of the gas and electrical works at Düsseldorf, for the kind and courteous manner in which they received and conducted us over their respective undertakings, and explained and answered our many questions. The two works are laid out side by side, and separated only by the railway accommodation. Of the electrical works I cannot say much, owing to inexperience; but, from what was seen, they are very similar to those erected at home, and are carried out on very similar lines, with the same regard to efficiency and cleanliness. The engines and dynamos were of the slow-speed type, varying from about 400 to 1200 horse power, driven by steam generated from water-tube boilers. Here was seen a novel means of removing the ashes by dropping them direct into a large cavity below the fire-bars, where they are slacked and carried away by trolley-waggons. A large and extensive filtering plant was also seen at work, cleansing the water, which was impregnated with large quantities of yellow ochre coloured matter when pumped from the well, but which did its work so well as to deliver the water clean and suitable for the purposes required.

Our interest was perhaps centred more on the visit to the gas-works, as here we had the chance of observing the different methods employed in manufacture. The retorts were all built in single beds, being the usual 10 feet long, and in sections of ten beds, each bed containing eight retorts, and were worked by hand labour, except one section, which was fitted up with a very simple and handy charging apparatus. Behind each section are built the mess-rooms for the men employed on it, separate from the others; a special feature here being the splendid arrangement of the baths, with the use of special combination hot and cold water taps for the shower baths regulating the water supply, so that scalding hot water could not be turned on to the bather by accident. The scrubbers, washers, tar-separators, &c., were all placed in buildings specially constructed for their accommodation, which, owing to the extreme climatic conditions during the winter season, require keeping at the proper working temperature by special heating apparatus contained therein. The rest of the works are, however, carried on under much the same manner and conditions as at home.

I might perhaps be allowed to especially remark upon the admirable self-acting and regulating governors for controlling the town's pressure. These governors are actuated by water, and can be regulated to the maximum and minimum pressures required with ease; but, unlike those in our general use, the valves can be readily cleaned and repaired *in situ*, at very little cost. We were greatly indebted to these gentlemen for their kindness; and it is this kindness which is extended, or ought to be extended, throughout the world among all gas managers we should endeavour to foster, as by its means many little things may be picked up and made use of, while the remembrances of being thus received and treated can never be effaced.

THANKS TO THE PRESIDENT—THE COMMERCIAL DEPARTMENT.

Mr. H. TOWNSEND (Wakefield) said a pleasing duty had been entrusted to him, and that was to move that the best thanks of the Institution be accorded to their worthy President for his very luminous and instructive address. Their President had

touched on a good many points, which might be considered burning questions. He (Mr. Townsend) had been very much interested in hearing his allusions to the competition they would have to face with Mond gas, and the experiments he had conducted and given the members the benefit of. The addition of blue water gas to ordinary coal gas for the purpose of meeting that competition was a field that would amply repay further investigation on the part of gas engineers. The President had given them some instructive information regarding the adaptability of incandescent gas-lights to the lighting of cotton mills. This, combined with the information which was received at their last meeting through Mr. Brearley and other members as to the lighting of woollen mills, could not fail to be of the greatest advantage to the members generally. The President also went rather exhaustively into the commercial department of the Institution. This was a matter that he (Mr. Townsend) was certain each and all of them wished to bring to a successful issue; and he was quite confident that any efforts put into that department would amply repay them.

Mr. S. MEUNIER (Stockport) seconded the motion. He thought that the address the members had listened to was certainly one that was peculiarly adapted to the present condition of affairs in the gas world. It had not been so much a record of work done or experience derived in the past, but it had had for its main object the bringing to the notice of the members the peculiar conditions which were now gradually coming into force, and which would have, unless taken at once in hand, a very bad effect upon the progress and success of the gas industry. The President had very carefully pointed this out; and he had suggested the various lines upon which this competition and the various new methods should be met and overcome. He had also drawn attention to one or two little dangers which had not been generally known, but which he had discovered by his little trip to Düsseldorf. It was indeed one of the most interesting addresses they could have had at this particular period of their history. There was just one little bit more with regard to the commercial branch of the Institution, which they all hoped at any rate would prove a distinct advantage, and which was one of the helps the President had suggested to overcome the altered conditions of affairs. The Secretary of the Manchester Section was still waiting replies from rather a good few gentlemen belonging to the section who had been asked if they would join it; and, if the members would excuse him, he should like to remind them that time was on the wing, and it was very desirable they should know quickly who they had to deal with, and who were willing to supply the information required. In common with the President, he thoroughly enjoyed the visit to the Düsseldorf Exhibition. It was certainly a revelation to them all; and the courtesy and kindness accorded to them by both electrical and gas engineers were worthy of emulation. The care that they seemed to take with regard to their men was very laudable, and something that should be imitated as far as possible. There were other little nickknacks, too, which were very nice indeed, and showed a very careful attention to detail.

Mr. W. W. HUTCHINSON (Barnsley) supported the proposition, remarking that he thoroughly endorsed every word that had been uttered by the proposer and seconder.

The motion was cordially adopted.

The PRESIDENT sincerely thanked the members for their acknowledgment; and he said that he should hope to see papers brought forward to amplify some portions of the address.

PAPERS READ.

Mr. HENRY FOWLER (Midland Railway, Derby) then read the paper—entitled "Notes on Working an Illuminative Photometer—which was prepared for the last meeting, but was, through pressure of business, postponed. The paper was published in the "JOURNAL" for Dec. 9 last, together with a few comments thereon. As a result of those comments, Mr. Fowler made an useful addition to his paper which we shall have an opportunity of reporting next week. At the close of the meeting, he explained to a number of interested members the construction and working of the illumination photometer, by the aid of a sample that he had present.

Mr. WILLIAM EVERITT (Ilkley) next read the paper on "Tar Fog," which appears on this page.

VOTES OF THANKS.

The PRESIDENT said the next pleasing duty he had to perform was to propose a resolution expressing their appreciation of the services of their Past-President, and for the excellent manner in which he had carried out his duties during the past year. He thought those who had had the pleasure of sitting under Mr. Graham in Committees, and knew the excellent way in which he had conducted his work, were perhaps best able to judge as to his abilities. He (the President) could at any rate say Mr. Graham had performed his duties in an exceptionally nice manner.

Mr. J. BRADDOCK (Radcliffe), in seconding the motion, said the geniality and kindness of Mr. Graham during his year of office had been admirable; and he had devoted himself to the work with great satisfaction to every member.

The motion was heartily adopted.

Mr. GRAHAM cordially thanked the members. It had, he said, been a great pleasure to him to hold the office of President; and he felt honoured in remembering that, when the members visited Mansfield, it was one of the largest meetings the Manchester Association had ever had. There was another matter he should like to remark upon. Last year they made an alteration in the rules for the election of members to the Committee. During his last few years' experience at their meetings, he had noticed there had been several members who had made a terrible shout and done all sorts of things to get on the Committee. They had succeeded; and now they did not even attend the Committee meetings. This was not the class of Committeemen they wanted. If the work of the Institution was to be kept going in the way it should be, those who were on the Committee ought to make a point of attending to the duties. At the last Committee meeting, there were several members who could not be present through meetings connected with their gas undertakings; but those who made the biggest shout twelve months ago had nothing at all to stop them coming to the meetings. They are not even present at this meeting. This was a thing that wanted looking to. He hoped the new President would not have anything of this sort to contend with, such as he himself had had during the last twelve months or so. He should like to propose a hearty vote of thanks to their retiring Secretary (Mr. Shadbolt). It had been very convenient for him (the President) to have the Secretary living so close to his own neighbourhood. He was pleased to know that Mr. Kendrick would be in close proximity to Blackburn; and he was sure, from his own experience, the President would find that very convenient.

Mr. KENDRICK, in seconding the motion, said he thought the little bit of breeze that was raised twelve months ago had not been justified at all. Mr. Shadbolt had carried out his duties in a most admirable fashion; and he (Mr. Kendrick) hoped that his successor would be able to do as well. (Laughter.)

The motion was heartily agreed to.

Mr. SHADBOLT said he was exceedingly obliged to the members for according him this vote of thanks. He had not held the office long; but he had had sufficient experience of it to enable him to form an opinion as to whether it was a post to be coveted or not. Their old friend, Mr. Harrison Veevers, reminded him, in conversation a short time since, that the Institution was one-third of a century old that day. The same gentleman had made the remark twelve months ago that it required a man with a thick skin to be the Secretary of the Institution. Some of the members immediately began to put the thickness of his (Mr. Shadbolt's) skin to the test; but he was glad to say he had escaped through the trials and tribulations of the year with a whole skin. Joking apart, he could assure the members that there was a great deal of pleasure to be derived from occupying the post of Hon. Secretary of an Institution like the Manchester. He had now to propose that the heartiest vote of thanks be accorded to the readers of the papers. The Committee made the remark towards the close of their report that they noted "with pleasure the increasing vitality of the Institution, and the growing desire of the younger members to participate in the responsibilities as well as the privileges of membership." This augured well for the future of the Institution. They had first one and then another of the young members stepping into the breach. So long as this continued, they would go forward and prosper, and the industry generally would benefit.

Mr. W. W. HUTCHINSON, in seconding, remarked that, in Mr. Fowler's contribution, they had an exceedingly interesting and instructive paper on a subject which had not been hitherto properly threshed out, and which was bound to come to the front. In seconding this vote of thanks to him, he did it with a lively sense of favours to come. Mr. Fowler was a gentleman of ability, of whom they might hope to hear, in connection with other sections of their profession, with great advantage. Mr. Everitt's paper was a practical one, which had evidently appealed to a good many present.

The vote was carried by applause.

Mr. FOWLER and Mr. EVERITT both made brief acknowledgment; and this concluded the business.

Tea was afterwards served; and a pleasant social hour or two was spent by the members.

TAR FOG.

By WILLIAM EVERITT, of Ilkley.

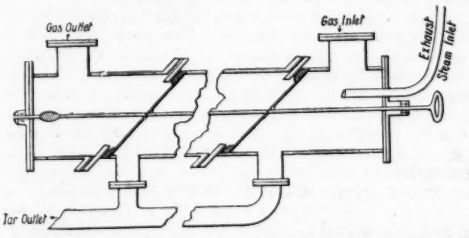
[A Paper read before the Manchester District Institution of Gas Engineers, March 7.]

Many and varied have been the devices to arrest the tar fog in crude coal gas; yet the tar-extractor pure and simple has not generally been acknowledged a necessity. Where no tar-extracting apparatus is in use, or where the make of gas has overtaken the capacity of such apparatus, the tar fog is the cause of many troubles experienced by the gas manager. In these cases, the condensers, in conjunction with washers or scrubbers, are given the duty of removal of this solid impurity, thereby impairing the usefulness of apparatus, which was primarily intended to deal with gaseous impurity only. Rough surfaces of ammonia-extracting apparatus are made smooth, and the finer particles of fog find a resting place at the point where the crude gas meets

its first real obstruction—viz., the first layer of purifying material; thus, in that department (with the ever present probability of a sudden rise of pressure), causing more frequent changes of boxes and a gradual clogging of the oxide.

My early impressions of tarry matter in crude coal gas were, that if the condensers were ample for proper condensation according to the well-known rules, then the tarry matter would be deposited with the watery vapour. Having, however, at one period to take part in the making of a coal-testing plant, I had cause to alter my ideas on this subject. It was found that when the actual condensing area was three times that of the theoretical, the tar fog would still make itself felt in the purifier. To overcome the difficulty of its extraction, several substances were tried; and in the end, loosely packed wool was found to be the most efficient medium through which to pass the crude gas so as to fit it for proper purification. After a few experiments with this medium, it was found that the illuminating power suffered to a very great extent, through the absorption of the light-giving constituents by the tarry wool through which the gas had eventually to pass. Finally, the wool became saturated, and offered so much resistance to the flow of gas that a fresh supply had to be inserted. This experience showed that, to completely get rid of the tar fog, the crude gas must be split up into very many minute streams; and each stream must be sub-divided many times by further obstructions. Yet to ensure the gas against loss of illuminating agents, all surfaces of these obstructions must be kept constantly clean.

Having been troubled on a practical scale with this tar fog, several theories were formulated to get rid of it before the gas reached the condensers. Wool and like fine substances were out of the question. The next best medium which presented itself was iron gauze of fine mesh; and seeing that the foul main, after travelling round the inside of the retort-house, dipped into a T with a blank flange, this situation lent itself admirably to the easy insertion of any medium chosen for the purpose. Twelve discs of gauze were cut to exactly fit into the 14-inch main. They were fixed about 8 inches apart on a central rod; so that when the blank flange was removed the whole arrangement could be pushed forward into position. An iron hoop on each end of the apparatus kept the screens in their places. No attempt was made to prevent the gas from passing where the



outer edges of the screens came in contact with the internal surface of the pipe; the main object being to experimentally use media to reduce the quantity of tarry matter passing forward to the scrubbers, and to ease the constant recurrence of excessive back-pressure on the purifiers.

At the time these screens were inserted, the exhaust steam-pipe from the exhauster was placed through the blank flange. Thus the gas was blown directly in regular puffs against the 200 ft. of iron wire of which the first screen was comprised; and no doubt this oscillation exerted its influence in causing tarry depositions to be made on each screen of the series. The steam was afterwards found to be serving a double purpose—viz., preventing the tar from actually adhering to the iron, and, secondly, it was throwing the gas with some force against the obstructions. Here it must be noted that any gas containing tar fog, when travelling slowly through any medium, whether of canvas, wool, or iron gauze, does not deposit one-thousandth part of that which can be deposited through the same medium at a high velocity. A remarkable and instructive illustration of this fact can be verified by any lover of the fragrant weed. It will be found that if tobacco smoke be allowed to percolate slowly through a linen handkerchief no deposit is made. But if it is blown through the handkerchief quickly, one gets a comparatively large quantity of tar; and the greater the force employed the more complete is the abstraction of this product.

The apparatus for some considerable time worked satisfactorily; the tar fog passing forward to the scrubbers being greatly reduced in quantity. The first indication of anything being wrong was the necessity of increasing the speed of the exhauster to get the same make of gas through the condensers; and on examining the pressures, there was found to be a difference of 2½ inches between the inlet and outlet of the new tar extractor. The illuminating power fluctuated, as did also the partial vacuum required to draw the gas through the screens. The frequent recurrence of this resistance led one to be anxious to see what was going on inside the apparatus. The blank flange was therefore removed. The first screen was seen to be completely covered with a tarry deposit, all in one cake, on the side facing the incoming gas; and as soon as the central rod was moved, the cake of tar left the screen, which was then seen to be as clean as the day it was placed there. The others showed that the same action had taken place throughout the series, though all were practically clean when removed, because of the tar having been shaken off during the withdrawal of the arrangement.

The screens were not replaced, because I had intentions of utilizing the information so gained in some way which would ensure them being kept constantly clean; and I had no doubt of being able to formulate a scheme whereby the whole of the tar fog might be arrested, and at a nominal cost. To record the many theories proposed to overcome the difficulty of arriving at a gas ideally fitted for the abstraction of the ammonia, and at the same time to preserve intact the illuminating agents originally formed, would be to no purpose. Suffice it to say that very many forms of apparatus embodying the ideas here stated were considered; but finally the arrangement shown was the one which to my mind appeared the most suitable to effect the desired end.

The screens in this case are elliptical iron wire discs in hard wood frames, which are planed to fit accurately against the internal flanges of the castings, as shown—this precaution to prevent short circuiting. They are placed at an angle of about 45°, inclined towards the incoming gas, in order that gravity might overcome capillary attraction and cause the tarry deposits to fall to the bottom, where they can be automatically drawn off. Each disc is fastened in the centre to a rod, which is secured at one end of the apparatus and passes through a stuffing box at the other; so that if the tar did cake, as it was shown to do when the screens were vertical, then the whole arrangement might at any time be shaken to loosen any deposit (a spiral spring, as shown, would greatly facilitate this).

The body of the apparatus would, of necessity, be composed of a series of castings with flanges internally and externally on the one end, and externally only on the other. I regret that up to the present I have not been able to get apparatus made on these lines; but at some future date I hope to place before you the results of practical work with such apparatus, not only in precipitating the tar fog, but also in abstracting ammonia and cyanogen by similar methods, when once the tar fog is removed.

Discussion.

The PRESIDENT (Mr. OGDEN) observed that the members had heard the paper on tar fog; and it was one on which many of them could give vent to their feelings. He should be pleased to hear what they had to say upon it.

Mr. H. TOWNSEND (Wakefield) said he had been much interested in the paper; but there was one thing he did not quite understand. It was the paragraph in which Mr. Everitt said: "At the time these screens were inserted, the exhaust steam-pipe from the exhauster was placed through the blank flange. Thus the gas was blown directly in regular puffs against the 200 feet of iron wire, of which the first screen was comprised; and no doubt this oscillation exerted its influence in causing tarry depositions to be made on each screen of the series." Did he (Mr. Townsend) understand the exhaust steam was admitted with the gas?

Mr. EVERITT: Yes.

Mr. TOWNSEND said this would explain perfectly why the screen was clogged up, because the steam would drive off all the naphtha and oil vapours of the tar, and leave only a pitchy substance behind, which would choke up the screens. With regard to this question of tar fog, he had had a good deal of trouble with it at Wakefield. The members would remember that he had no scrubber there; and there was nothing to take the tar out of the gas, except the condensers. The condensers at Wakefield were on the Körting and Cleland slow-speed principle, by which there was a good deal of friction. There were bundles in each pipe, through which the gas had to pass, and which caused the tar to be deposited in the condensers. But even then the gas, after passing through the condensers, and going through a Walker washer and a Clapham washer, still contained a large amount of tar which fouled the purifiers. The trouble was so great that he had to throw the Walker washer out of action every three months regularly; and the Clapham washer got so choked with tar that he had to take all the bundles out, and clear them by boiling in hot water and benzol. It reached such a pitch that he put a Pelouze and Audouin tar-extractor in; and he placed it immediately on the outlet of the exhausters. He was pleased to say this completely cured the whole trouble. He then put a pipe on the outlet of this apparatus in the exhauster-house, and the method of working had since been as follows: They held a piece of ordinary writing paper to the test-cock; and, as a rule, there was not the slightest sign of tar or any discoloration of the paper. This was how they worked now. He did not trouble much about the temperature at the outlet of the condensers. They preferred it to get as high as 70°. The Pelouze and Audouin extractor worked much better at a high temperature than at a low one. He thought this was the reason it was not more generally used in England. It was put up in the open air; and, after a heavy frost, the tar got so cooled in this apparatus and choked it, that it threw a lot of back-pressure on the works, and got into disfavour. Having an idea of this kind, he put the tar-extractor under cover, and in a warm corner of the works, so that the temperature would never get very low; and they found it easy to maintain the temperature at the outlet of the apparatus at 70°. At this temperature it worked admirably; and it extracted every particle of tar without any trouble. In hearing this paper, it recalled to his mind the one read a short time ago at the meeting

of the Southern Association by Mr. Thomas Glover, in which he stated that experiments had been made to cure the naphthalene trouble by inserting a modification of the Pelouze and Audouin extractor on the foul main. He (Mr. Townsend) had been looking forward with some interest to further information on this subject. He was strongly of opinion that the naphthalene trouble was to be cured entirely—if it was to be cured at all, and he was hopeful it could be—by some such method as Mr. Glover had foreshadowed. If the gas was properly treated with the hot tar fog on the outlet of the hydraulic, he believed that all naphthalene could be eliminated, and so prevented from getting into the apparatus on the works or the mains in the district. He had been in hopes that before this some firm would have been advertising the necessary apparatus for accomplishing this end.

Mr. R. Hooten (Ashton-under-Lyne) said he was surprised to hear about this tar fog. In his own case, he was well equipped for extracting it with the ordinary apparatus on the works; and if he had any tar, it was simply in the bottom of the purifiers and then in only a thin layer. He had not the slightest trouble from tar clogging the boxes, as he was able to take it all out.

Mr. Arthur Graham (Mansfield) said he was sure it was interesting to all the members to hear of experiences in these matters from other parts of the country. About three years ago, he was putting in some large purifiers, and he had a very small scrubber. After he got the purifiers working, he had to be continually changing his boxes through their being continually blocked up with tar. At the time—the winter being near—he could not do anything that season but struggle through; and the following summer, he enlarged his scrubbing power. At the time that he had only one tower scrubber, he was continually changing boxes; but when he got his new scrubbers completed (which were equal to 1 million cubic feet a day), he never had any tar at all in the purifiers. The trouble seemed to be when the size of the scrubbers throughout was too small, and small particles of tar were allowed to go forward and past the condensers.

Mr. R. G. Shadbolt (Grantham) remarked that this question of tar fog was a very great bugbear in some works; and he was suffering personally. They were in this particular position at Grantham. Their maximum make approximated to ½ million cubic feet a day. They had a ¾ million Livesey washer; a foul scrubber, which if it had its counterpart would be equal to 1 million cubic feet a day; and they had also a small fresh-water scrubber. They were also in this peculiar position, that they had two 25 ft. purifiers and two old ones 12 ft. by 15 ft. each. In these small purifiers they used lime; and they were very much troubled in the winter time, when they were about nearing their maximum make, to hold the small purifiers back a sufficient time to get the other boxes changed, for the reason that the bottom of the lime boxes became coated with a film—it was more an oily sort of film than a tarry film. They had put in a layer of small broken coke to absorb this film; and there was no doubt that a tar fog which would carry through and run the gauntlet of the plant he had mentioned before eventually reaching the purifiers should be dealt with by some other means. He thought that the author of the paper had hit upon the right thing, or the right idea, when he attempted to take it out by friction. There might be some deposit from the exhaust steam; but he (Mr. Shadbolt) thought the deposit from the gas was likely to preponderate, and any slight deposit from the exhaust steam itself would form a small proportion of the entire deposit that was found upon the screens. The author had not been able to try the modified apparatus yet; and he (Mr. Shadbolt) hoped that this time next year he would have had such an experience with it that he would be able to show that he had discovered the means of taking out this tar-fog in this very simple manner. He hoped that Mr. Everitt would let them know what success he met with.

Mr. Graham said there was one question he had omitted to ask, and that was what action Mr. Everitt found the condensed steam had upon his ammoniacal liquor. Formerly, as members well knew, they used to have a steam-jet in their exhausters; but it would be remembered that this had to be abandoned owing to the extra amount of water that got mixed with the liquor.

Mr. Everitt: The quantity of steam is very small indeed.

Mr. J. H. Brearley (Longwood) said that in his case they had no tar-extractor; but they had a tower scrubber equal to 300,000 cubic feet, and a washer equal to 400,000 cubic feet; and they had never been troubled with any tar or oily film in their purifiers. All their tar was extracted by the condensers. Only a little trace went forward into the washer. Last November—the first time for thirteen years—their washer threw about 2 inches back-pressure. Prior to that they never had above 1 inch back-pressure from the washer; and they then found the cause to be the making-up of the brushes with tar. He thought their experience went to prove that the last portion of their tar was extracted before the gas got into the purifiers. He had never been troubled in the purifiers. Their purification had cost them ½d. per 1000 cubic feet during the past five years; and they had extracted all the carbon bisulphide, but not all the carbonic acid. He was astonished that Mr. Shadbolt should experience a thin oily film in the bottom of his purifiers after passing through all the scrubbing and washing plant that he mentioned. In his own case, as a secondary advantage of the washer, he looked upon it as a tar-extractor; and he had not regarded it as necessary to have any extra plant so as to extract the tar.

Mr. Shadbolt said he thought if Mr. Brearley had his (the speaker's) peculiar set of purifiers to deal with, and had to work with such a restricted area, he would cease to be astonished, and at once understand it was only when they came to restrict their purifying area that they discovered this little film, and found it causing back-pressure.

Mr. J. Wilkinson (Sheffield) said he was astonished to hear that Mr. Brearley had never in thirteen years found tar beyond his condensers. [Mr. Brearley: I said washers.] It was really a most peculiar thing that in some works they would be able to go along, and not find tar in the purifiers. He himself was in one works for six years, and he never found tar in the purifiers. But there was no doubt that in many works it would get into the purifiers do what they would. But as regarded the frictional remover, he believed that was really the proper thing. A friend of his connected with a wood-gas tar-works asked him a few weeks ago how they managed to get the tar out of coal gas. He (the friend) was telling him that he was condensing the wood gas to 32° and 35°; and even then he could not extract the whole of the tar. If they could not extract the tar out of the wood gas at 32°, he (Mr. Wilkinson) did not know how they were going to do it with the condensers at 60° or 70° to keep down the naphthalene trouble. He believed Mr. Everitt was on the right track in adopting frictional apparatus for the total removal of the tar.

Mr. H. Kendrick (Stretford) could not say that he had had any experience of tar fog in connection with coal-gas plant; but he had had a fairly good experience of it in connection with carburetted water gas. His first winter's experience with carburetted water gas, although working at considerably higher heats than the makers did when they were running the plant for trial, was that it took two men all one day to pump the condensed tar and oil out of the first purifier. This was after a week's frost. Since then they had improved matters very considerably; and although he thought that they were getting better results so far as illuminating power was concerned with carburetted water gas than three years ago, the tar fog was still there. In the bottom of every lime purifier they changed, they found the presence of the oil tar on the first layer. For the matter of about 2 inches up it was coloured a deep brown. He had now before his Board a proposition to put in a Pelouze and Audouin tar-extractor, to see if they could not get rid of the trouble. Mr. Shadbolt said that in his case the trouble arose principally through the two small purifiers. In his own case, he should rather say that the trouble had arisen more through the carburetted water gas engineers adopting the American practice of restricting the other portions of the plant—the cooling and the scrubbing apparatus were very deficient as compared with the coal-gas plant. Considering, too, that the gas had to run the gauntlet of the relief holder, it showed the persistence of the tar fog to find it carrying so far forward. Referring to one of the remarks by Mr. Townsend, he was rather surprised to find that he advocated keeping up the temperature of the gas at the outlet of the condenser to 70°. In common with Mr. Wilkinson, it was quite evident he had not had much experience with naphthalene; otherwise, he would not have made such a suggestion. At two of the works he (Mr. Kendrick) had been connected with, the Chief Engineer used some very strong language indeed if he found the condensers were ever allowed to get above 60°; and the moment they got up to 62° or 63°, naphthalene was much more in evidence both on the works and in the district.

Mr. J. H. Buckley (Formby) asked the author whether he had experienced this tar fog during the maximum make or during the minimum.

Mr. Everitt: Only during the maximum.

Mr. Buckley asked whether that did not prove that his plant—such as the foul main, condensers, and scrubbers—were at fault, and not capable of doing their duty in a proper manner.

Mr. Townsend said he should like to answer Mr. Kendrick. He thought the Pelouze and Audouin tar-extractor was a good preventive of naphthalene. This was the first winter he had worked with it, and he had had no trouble at all; whereas last year, working without the tar-extractor, and with the temperature at 60° on the outlet of the condensers, they had a great deal of trouble with naphthalene.

Mr. W. W. Hutchinson (Barnsley) said he should like to point out that there was a difference between the ordinary condenser and the Pelouze and Audouin extractor with regard to the temperatures. He took it that the latter was really to get rid of the heavy tars that were undesirable in the gas, and to avoid taking too much of the hydrocarbons that they wished to retain in the gas. Therefore the outlet temperature of the Pelouze and Audouin extractor should be kept up; otherwise detriment would ensue to the gas manufactured. He should like to ask Mr. Townsend what he found the instrument would take out of the gas—the proportion of tar that he found resulted from the use of the Pelouze and Audouin extractor, either in gallons per ton, or the proportion per ton of the whole make. It appeared to him (Mr. Hutchinson) that Mr. Everitt's idea was one underlying the principle of the Pelouze and Audouin extractor, and he would like to know if he had considered the use of that instrument, because it appeared to him that it was an apparatus that really did, in a proper mechanical way, perform the duty required of it, and that it certainly would be an advantage in most gas-works to use it—for this reason, that they would ensure, under all conditions, whether maximum or minimum make, the getting rid of the tar

before it entered the other portions of the apparatus. He had himself been contemplating the introduction of this apparatus at his own works. Although they did not suffer from tar fog, he found a lot of tar; but it was no trouble in any sense as tar fog. But it was found on the boards of the tower scrubbers, which was an undesirable place for it to be. They had a Livesey washer; but it did not always perform the full duty required of it. He did not say it was inefficient, but he thought it required enlarging.

Mr. A. E. BUCKLEY (Holmfirth) said the chief idea of Mr. Everitt was to keep the tar deposit out of his purifiers. Now, in accordance with the laws of coal-gas manufacture, the tar had to be extracted before it got to the purifiers, and to do this meant condensation and extraction; and they knew that, if they took particular notice of the temperatures of their condensers and foul mains, they could keep the tar from going into the purifiers —that was, if the plant was in order. He was at present using oxide of iron exclusively; and he had had no trouble with tar fog. He had no tar-extractor; but as an extra precaution, he had put a syphon on the inlet of the condensers—down below, at a lower level than the condenser inlet—so that any tar arriving at that point was extracted before it went into the condensers. He had also a Holmes rotary washer, which was a very valuable tar-extractor indeed. They made it a practice, and had been doing it now for four months, to drain off all the taps every morning; and they found plenty of tar there to be drained off. He thought the great secret in dealing with tar fog was to have a good foul main and plenty of length.

Mr. G. H. NIVEN (Cleckheaton) asked Mr. Everitt whether he had a scrubber at all, because at one time his predecessor did away with the scrubbers entirely, and he (Mr. Niven) thought that might be the cause of his tar fog. He had, in his own case, two condensers—one an annular. In this he had always kept his gas at a high temperature, and cooled it in the other one, which was a double-row pipe condenser. He had also two good scrubbers; and he never found in his washers the least trace of tar, and never in his purifiers, even when he had some very small ones. If in the first condenser they kept the gas at a pretty high temperature, and then cooled it gradually down, they would dispense with the tar fog.

Mr. BREARLEY asked whether Mr. Everitt had a washer on his works in addition to the two scrubbers. [Mr. EVERITT said he had not.] It seemed to him Mr. Everitt would get friction extraction in the washers just the same as by the proposed method.

Mr. J. BRADDOCK (Radcliffe) said he thought that it might be interesting if he referred to his experience of the past two winters —particularly as the contrast between last winter and this one had been so satisfactory and agreeable to those concerned. Last winter, and up to then, they were accustomed to work with a single layer of oxide in the purifiers—in one solid mass. By reason of the growth of the business (it had now come to about ¾ of a million cubic feet per day), the back-pressure began to trouble them, so much so that at times it would rise to 30 or 36 inches of pressure. As a consequence, the purifiers had to be charged before their time—before they obtained a foul test. To discover the cause, they introduced net work into the lower part of the boxes, and as it were catching any moisture and impurity, and determining whether it arose from this source or not. They discovered it did. With their make, they found they could not get the gas through one mass of oxide with this troublesome back-pressure. As a consequence, for this winter, they provided a second layer of grids. The lower layer was simply a thin one—5 or 6 inches in depth; and the upper layer remained in one large mass. The contrast, as he said before, between this winter and last was most satisfactory. The number of boxes changed was perhaps one-third what they were then; and although he did not put this forward as a remedy for tar fog, still it was a means of getting the gas to the holder, which was as important as anything could be during the winter.

The PRESIDENT said the paper and discussion proved what had been on his mind for a long while—that the abstraction of tar from gas could only effectually be accomplished by the apparatus itself being sufficiently large for a full and maximum day's make, and allowing the gas a slow travel. This, to his opinion, was one of the means of effecting it; and it was proved also from the statement of the author that he only experienced the difficulty during the winter months when his maximum make was on. In that case he would find that the larger and longer travel of the gas through the condensers or pipes would effect a great reduction of the tar fog he was at present troubled with. Referring to Mr. Kendrick's remarks about carburetted water-gas, he had also been troubled with an apparent tar fog; but in his case it was not of a tarry, but more of an oily nature. He found the only method of getting over it was by putting in the purifiers a lower layer of small breeze and ashes; and this effectually, so far as they were concerned, answered the purpose. A change of this ash every three or four months was all that was required.

Mr. EVERITT said to attempt to reply to each speaker would be impossible. All he thought it was necessary for him to say was that the Pelouze and Audouin extractor was no doubt about the only thing on the market that would take out the tar fog. They could travel coal gas through miles of pipes, but they could not take out all the tar fog in that way without friction. But the Pelouze and Audouin tar-extractor missed this one great point—that tar fog could be extracted very rapidly if they blew it quickly through a fine material.

ARTIFICIAL LIGHTING IN THE NINETEENTH CENTURY.

As briefly recorded in the "JOURNAL" last week, Mr. D. MACFIE, of Messrs. James Milne and Son, Limited, read a paper on the above subject before the Edinburgh Architectural Association on the 25th ult. The following is an abstract of the paper.

The author began by remarking that the history of the Nineteenth Century was one continuous record of achievement in chemical, mechanical, and industrial science; and it was difficult for us, who enjoyed the fruits of the pioneer inventions of the last century, to realize how much had been gained during that period in the comforts and conveniences of modern civilization. Putting themselves in the place of those who were grown men on the threshold of last century, they realized that in two departments of human activity—artificial lighting and means of locomotion—that generation was practically no farther forward than their forefathers had been for generations. Their means of transport were no speedier, either by land or by sea, than that of the Roman legions when they visited these shores in the time of Julius Cæsar. If the Roman legions traversed sea and land as rapidly as did our forefathers in 1800, it might be suggested that the early Roman Camp was equal to such lighting appliances as were then in general use in this country. The Nineteenth Century development of artificial lighting was as marvellous as was the progress made in means of locomotion during the same period. Instead of the home-made rush candles or the chandler's tallow dip, they had "that beautiful scientific product, the paraffin candle;" and in place of the evil-smelling "cruisie" there was the perfected paraffin lamp, competing in cheapness and lighting effect with any other present-day illuminant. Coal gas lighting, an invention of the close of the Eighteenth Century, and an accomplished fact in the first decade of the succeeding one—had developed from the cockspur jet to the non-luminous flame of the Welsbach burner, with its brilliant incandescent mantle of rare earths, doing such high duty as the pioneers of gas lighting never dreamed of. Electric lighting arrived, and in a few short years it had made rapid strides in popular favour; convincing a previously indifferent public that a profusion of light was well worth paying for. In its train the electric light had brought indirect advantages, just as gas lighting gave a fresh impetus to improvements in candles and lamp making. In a marked degree the electric light had quickened the energies of the makers and sellers of gas, who had been too long content with moderate progression, while they had the field to themselves.

The beginnings of artificial lighting were pre-historic; but the resinous pine torch was perhaps the most primitive lighting appliance. The earliest lamp was associated with the cave dwellers, and took the form of a sea shell or animal's skull, with a reed for a wick. Egypt, Greece, and Rome in turn developed that simple form of oil-lamp, and gave it artistic shape in pottery, marble, and metal work; but the primitive type was preserved. As early as 1241 B.C., street lighting was in evidence, when Roman soldiers patrolled the city streets with flambeaux dipped in grease. In 331 B.C., candles were used for lighting the streets of the capital of Persia, by the order of Alexander the Great. Constantinople was lighted with candles in 323 A.D., and Antioch fifty years later with oil-lamps. An early type of oil-lamp was used in Egypt about 33 A.D. It hung from a crook carried in both hands, having copper top and bottom, on which cloth smeared with wax was stretched. Torches, candles, and oil-lamps for heavy oils were the appliances in use until the dawn of the Nineteenth Century, which, within its compass, produced a succession of marvels revealed by the "Genii of the Lamp." In Edinburgh, a hundred years ago, Princes Street was lighted by 79 oil-lamps. But, ere it closed, the Eighteenth Century saw the beginning of a new era, in the invention of gas lighting by William Murdoch, a humble Scottish millwright, of Bell's Mill, Old Cumnock, who, in 1792, completed the first installation of coal gas in the lighting up of his house and offices at Redruth, Cornwall.

One disturbing element in connection with gas supply throughout the country was that the illuminating power varied so much. There had always been an essential difference in the average quality of gas supplied in Scotland, as compared with England, due at first to the great fields of rich cannel coal in the former country. It was usual twenty years ago to claim for Scotch gas that it varied from 28 to 30 candle power, as compared with 14 to 16 candle power in England. Local conditions and changed circumstances had contributed to upset the balance; and while the lighting value in Scotland considerably exceeded that furnished in England, Scotch gas need not be rated higher than from 20 to 25 candle power. In some centres the reduction had been duly notified, but there existed generally too much uncertainty as to the quality supplied in each lighting district; and there should be candour on the part of gas companies and corporations as to the illuminating power, and a sustained effort made to keep it invariable. That was not the time or place to discuss the merits of high *versus* low illuminating power gas, but the trend of opinion and the force of circumstances pointed inevitably to a general lowering of the standard. Some high authorities contended that even 14-candle power was too high, in view

of the increasing use of gas for heating, cooking, and motive power, and the growing popularity of the incandescent gas-burner. And yet it might be suggested, in the interests of "the million," who must for years to come be content with flat-flame burners, that the quality had already been sufficiently lowered in the country which had so long boasted of its high quality cannel gas. During that week, the formal inauguration would take place at Granton of new gas-works for the Edinburgh and Leith Gas Commissioners.* These works occupied an eminently suitable and magnificent site, and in their arrangement and equipment they took a unique place among the gas-works of the world. They reflected credit on those who took up the problem of erecting works to meet the present-day requirements of Edinburgh and Leith, and were a monument to the skill and courage shown by the Engineer, Mr. Herring, who had faced new problems and processes with infinite resource. Although gas from heavy oils got its *quietus* early in the century, its close saw the revival of oil gas manufactured from residual products of shale oil. Such gas is made by Pintsch and others for use in railway trains, gas buoys, and country mansions. It is readily compressible, being for some purposes compressed to ten atmospheres. It is of high illuminating power, and is admirably suited for such purposes.

The first gas company was formed in 1810, and in that same year Sir Humphry Davy first applied the electric current to the production of light. He found that when two carbons attached to the terminals of a powerful battery were in contact, and were then drawn slightly apart, the current, crossing the gap, formed what was called the electric arc. That was, in essence, the electric lamp of to-day. The commercial importance of the discovery was suggested after the development of the dynamo electric machine of Faraday in 1831; but little practical result followed for many years, although ingenious attempts were made from time to time to overcome the difficulty of feeding the carbons. It was in the development of the dynamo electric machine, and the consequent production of electric current on a large scale at reasonable cost, that electric light came within sight. When, in 1880, the incandescent lamps of Edison and Swan were introduced, the question of popularizing electric lighting for domestic purposes was solved. Incandescent electric lighting is more costly than that of the arc lamp; but its yellowish tint renders it pleasanter in use, and as it lends itself to easy distribution and general convenience in fixing and replacing, it is universally preferred for indoor use. The progress of electric lighting for public and domestic supply had been phenomenal, and it was destined to hold the chief place in public estimation in the future.

The story of the Edinburgh municipal electric supply was altogether creditable to those who organized the undertaking, and to the officials who had been entrusted with its management. It was a wise arrangement which secured Bailie Mackenzie for the convenership of the Electrical Committee, and everyone recognized the ability he had displayed in guiding the policy of that great and successful department of municipal work. The Edinburgh electric lighting supply was turned on in the spring of 1895, at an initial cost of about £120,000. Starting with 452 consumers, and an equivalent of 57,690 8-candle power lamps, it had, in May last, served over 5000 consumers, using 465,000 lamps, totalling at the beginning of February last no less than 526,000 8-candle power lamps. Beginning with a charge of 5½d. per unit, the rate had been gradually reduced, until now current was supplied to the public at 3d. per unit; and the gratifying result was a profit exceeding 7 per cent. on the capital employed. Apart from the particularly low charges to users, the city rates had benefited to the extent of £10,000, and a reserve fund had been built up of nearly £27,000, in addition to the redemption of its loan capital to the extent of almost £87,000. The technical journals emphasized the fact that "for economical working, the Edinburgh works had always held a foremost position." The rapid growth of the demand for power pointed to an almost unlimited field of operation in the numerous minor workshops throughout the city; and already there were over 750 motors supplied from the city mains. It was a notable event in the street lighting of Edinburgh when, in January, 1822, 53 gas-lamps took the place of 79 oil-lamps in Princes Street; but that event was totally eclipsed when, on April 11, 1898, 2000-candle power electric arc lamps were simultaneously turned on by a single switch at the west-end of that noble thoroughfare. To-day there were no fewer than 875 electric street arc lamps of 2000-candle power (nominal) engaged in lighting 38½ miles of city streets.

But the age of contrasts continues. For many years previous to the date referred to, the gas lighting of Edinburgh streets was a national byeword and reproach. At the present day, it was little short of a scandal that in Twentieth Century Edinburgh, a unique installation of an antiquated style of gas-lamp exists side by side with the electric arc lamp. It was true that in some six thoroughfares throughout the city there were specimen installations of incandescent gas lighting; but those, and the 38 miles of electrically lit streets, only served to bring into strong relief the 151 miles of streets within the city boundaries which are still lit with an effete style of gas-lamp, designed in the early years of last century for the single cockspur jet, having a cover devised for removal by the lamplighter.

Long after the lamplighter's torch came into general use, Edinburgh persisted in lighting with lamp and ladder, until, 16 years since, the globe lamp was adapted for torch lighting, by having holes cut for the insertion of the torch; thus nullifying any merit which the shadowless globe lamp had to justify its use. The effect of that change was at once absurd and ludicrous, and might be seen on any windy evening, as the inrush of air through the aperture played havoc with the light, and produced a twisted, smoky flame. In high winds, it was not unusual to find two out of three lamps in darkness, with gas escaping into the midnight air. The juxtaposition of electric arc lamps and an effete type of gas-lamp, consuming only 2 cubic feet of gas per hour, doing eight candle duty, was not matched in the United Kingdom; and it was not creditable to the powers that be that, while they had widely and generously adopted the electric arc lamp for street lighting, no sustained effort had been made to improve the system of gas lighting already existing. This would have been surprising if the making of gas were still in the hands of rival companies; but it was fourteen years since a Joint Committee of the Corporations of Edinburgh and Leith took over the manufacture and distribution of gas throughout their lighting districts. It must be recognized that the lighting of the city was no part of the work of the Gas Commissioners, as such. Their duty was limited to the manufacture and supply of gas to the consumers. The responsibility for street lighting rested with the cleaning and lighting departments of each community. With the electric supply it was different; for the Town Councils each owned electric lighting stations—and perhaps the mixed character of the Gas Commissioners partly accounted for the fact that street lighting by gas in both towns was behind the age.

There need be nothing but praise for what had been done in electric lighting; but as it appeared to be generally conceded that, on account of the cost, a halt must be called in that direction, it might not be unprofitable to inquire what steps could be taken, and at what cost, to improve the 151 miles of gas-lit streets in Edinburgh to-day. As a first step towards this end, the present globe lamp, with its blow hole, should be abolished with all convenient speed. To replace these, square tapered lanterns might be substituted at a slightly increased cost, of a type that would suit equally well with an enlarged flat-flame burner or a Welsbach incandescent burner. If flat-flame burners were adopted throughout to consume 3 cubic feet of gas per hour, instead of 2 cubic feet as at present, the improvement would be equal to an increase of over 75 per cent. That would be only a half-measure; and while it might serve for the less populous suburbs or districts, securing a greatly improved light at a cost, for gas, of only 6d. per hour per 100 lamps, it could not be considered as sufficient for the more frequented thoroughfares. The only method worthy of serious consideration for important streets was the adoption o the incandescent burner. Already incandescent gas-lamps were installed in about 1½ miles of streets; but no serious nor well organized attempt had been made to keep those lamps and their burners in the best condition. Few of the lamps appeared to be furnished with anti-vibrators or mantle protectors; but, that apart, it was no unusual thing in Edinburgh to find mant'es frayed in ribbons and giving only a fitful and uncertain light, while lanterns might not seldom be seen where the flash light meant to ignite the burner was in itself the only visible source of light in the lantern.

The present cost of Edinburgh street lighting might be thus roughly estimated. There were 875 electric lamps, lighting 38½ miles of streets, each lamp costing the Lighting Department £13 per annum—in all, £11,375. Gas-lamps lighted up 151½ miles of streets, at a total cost of about £14,000, made up as follows: 9459 flat-flame gas-lamps each consuming 2 cubic feet per hour, at 19s. 7d. per lamp, £9265 10s.; 345 similar lamps consuming 2½ cubic feet per hour, at 29s. 4d. each, £506; 42 incandescent gas-lamps consuming 3 cubic feet per hour, at 34s. 7d. each, £72; and 96 similar lamps consuming 4 cubic feet per hour, at 38s. 5d. each, £185—together £10,028; add for cleaning, lighting, and extinguishing (say) £3977, making £14,005. From these figures, it appeared that while for a 2 cubic feet per hour flame, giving 8-candle power, the inclusive charge was 27s. 7d. per annum, a 4 cubic feet incandescent burner, giving at least 65-candle power, would cost only 46s. 5d. per annum; or they would have eight times the light-giving power for less than twice the cost. Edinburgh was at present spending only £2600 more per annum for the gas lighting of 151½ miles than it was spending on the remaining 38½ miles of electric lit streets. No one would suggest that what had been done in electric lighting was not well done; but it was reasonable to suggest that the time had come to improve some portions of the remaining three-fourths of street mileage hitherto denied the luxury of electric lighting. A modest beginning might be made with (say) fifty miles of the more important thoroughfares with 3-feet incandescent gas lights, at a cost of (say) 34s. 7d. per lamp, an extra charge of 15s. each, or £46 16s. per mile, per annum, with the lighting power five times increased. To this would have to be added the cost of mantles and renewals and the initial cost of the installation of new lanterns. The 100 miles of streets still remaining might at once have burner tips consuming 3 feet per hour substituted, at a merely nominal cost, while the increased charge for gas would only amount to 10s. per lamp per annum, giving a better light by 75 per cent. Such globe lamps as remained in use could have a metal lifting flap fitted for the covering of the present blow-hole. These suggestions might be worth much or little; but the question was claimant, and

* An account of the inaugural ceremony was given in the "JOURNAL" last week (p. 537).

would not brook delay in the public interest. One could not help feeling, indeed, that if the gas lighting of the streets of Edinburgh and Leith were entrusted to the Gas Commissioners it would be to the public advantage.

Within five years of the close of last century, a new and powerful illuminating agent had made its appearance in the form of acetylene gas. In a few short years, it had made marvellous progress, and it bade fair to eclipse all other means for lighting villages and country houses in remote districts, for which it was admirably adapted. Rich as the first half of last century was in chemical and mechanical invention connected with artificial lighting, the last quarter of that century greatly exceeded it; and the twenty-five years which produced the regenerative lamp and the Welsbach burner, the arc and incandescent electric lamp, and acetylene gas light, was without duobt the most prolific period in lighting invention. What the Twentieth Century might produce no one could tell; but from whatever quarter progressive improvements came in regard to illuminants, they would be welcomed as a contribution to the world's desire for "light, more light."

[Mr. Macfie's paper was largely historic in character, and descriptive of processes with which our readers are familiar. It was profusely illustrated with lime-light views of apparatus, and of artificially lit streets.]

Mr. T. Ross proposed a vote of thanks to Mr. Macfie, and suggested that the Association might have so valuable a paper published.

GERMAN PROGRESS IN THE RECOVERY OF CYANOGEN.

(*Continued from p.* 481.*)

Lime or soda is selected for use in preference to other absorption agents, because neither of these two agents conduces to any extent to the formation of dissolved sulphides. Consequently, on the one hand the formation of sulphocyanides is almost wholly avoided, and, on the other hand, the solutions obtained are not contaminated with sulphur compounds. Appendedis the result of an analysis by Herr Feld of calcium ferrocyanide obtained in the manner described—the solution being merely evaporated, without removal of sludge, until crystallization took place.

57·15 per cent. total calcium ferrocyanide [Ca_2 Fe $(CN)_6$ + 11 H_2O].
0·10 ,, ,, calcium sulphide [CaS].
1·10 ,, ,, ferrous sulphide [FeS].
0·30 ,, ,, calcium sulphocyanide [Ca $(CNS)_2$].

Though the use of lime in place of soda as the absorbent presents the disadvantage of slower absorption, yet it is preferable to use it, even though a larger washing plant has to be installed, for the following reasons. It is cheaper than soda. The sodium salts resulting from the reaction with the ferrous salt, and the excess of soda contaminate the ferrocyanide liquor, when soda is used; but the calcium ferrocyanide solution obtained when lime is used contains no foreign salts, more especially if ferrous sulphate is the iron salt employed. Further, the calcium ferrocyanide can be applied for the manufacture of any cyanogen compounds—*e.g.*, potassium cyanide, sodium cyanide, potassium ferrocyanide, sodium ferrocyanide, &c.; while sodium ferrocyanide can only be worked up to pure sodium cyanide or pure sodium ferrocyanide. The market value of the calcium salt, therefore, notwithstanding its lower cost of production, will be higher than that of the sodium salt. In many cases, the crude cyanogen may be preferred in an insoluble to a soluble form; and the question which is the most advantageous must be settled from time to time between the gas-works and the buyer of the crude cyanogen product—being dependent mainly on what ultimate product the crude material is to be worked up to. It will be to the advantage of the gas-works to take this question into consideration as much as possible, because it is quite feasible to produce at will either a soluble or an insoluble crude material in one and the same washer. But it is important, when an insoluble product is produced, to make sure that it is uniform in composition, and as nearly free as may be from sulphur and other impurities.

Similar conditions to those set forth for the production of a soluble crude material may also be laid down for producing solely an insoluble material. The iron compound used for the absorption must be as nearly as possible free from ferric oxide, because the latter causes sulphur to separate in the washer. It is consequently again advantageous to introduce the solution of ferrous salt, for use in the absorption for the recovery of an insoluble form of crude cyanogen, into the washer apart from the alkali required for precipitating the ferrous oxide. This prevents the formation of ferric oxide. It follows that in this case only one molecule of a divalent base—*e.g.*, lime—must be used per molecule of ferrous salt. An excess of alkali must be absolutely avoided, as otherwise a soluble alkaline ferrocyanide results, which, if present even in only small quantities, makes the product relatively worthless to the buyer. The absorbent must likewise not be introduced into the washer *en bloc*, but rather in correspondence with the progress of the absorption of the hydrocyanic acid. Care must therefore be taken that there is always some fresh absorbent in the washer. Otherwise, as the ferrous oxide soon becomes converted into sulphide, only slow and secondary absorption of hydrocyanic acid would occur. A larger washing plant is required for producing an insoluble than a soluble crude cyanogen product, as the excess of alkali which accelerates the absorption is not present.

It has still to be discussed how the production of those cyanogen compounds which cannot be turned to account, and therefore represent a loss of cyanogen, can be avoided in the washing process. Two sources of such loss are possible—viz., the formation of sulphocyanides and that of carbonylferrocyanide. The amount of the latter is so small in any case that it may be neglected. But the loss through the formation of sulphocyanides may amount to 60 per cent. and over, if the conditions which are favourable to their production are not avoided. This point was treated exhaustively by Dr. Leybold in 1893; and more recent investigations have not greatly widened our knowledge in regard to it. Dr. Leybold observed that spent oxide which contained a high proportion of ammonia always contained much sulphocyanide and but little prussian blue. He quoted the results of a large number of analyses in support of his observation, and drew from them the conclusion that the loss of cyanogen through the formation of sulphocyanide was directly proportional to the ammonia present during the absorption of the cyanogen. In order to show clearly the relation which he found subsisted between the proportion of ammonia present and the sulphocyanide formed, it is convenient to state the amounts of prussian blue and ammonium sulphocyanide in terms of hydrocyanic acid, as in the subjoined table, in which the last column shows the percentage of the total cyanogen absorbed which is lost through the formation of sulphocyanide. The figures in the first three columns are percentages by weight on the samples of spent oxide analyzed.

Sample No.	Ammonia.	Hydrocyanic Acid as		Hydrocyanic Acid Converted to Sulphocyanide.
		(1) Prussian Blue.	(2) Ammonium Sulphocyanide.	
1	2·86	1·695	2·117	55·5
2	2·84	2·407	2·338	49·0
3	2·82	1·526	2·865	65·0
4	1·66	1·283	1·343	51·0
5	1·01	2 746	2·554	48 0
6	0·41	3·052	0 865	22·0
7	0·38	5·821	0·796	12 0
8	0·37	4·476	0·163	3·5

Though the second result does not fall into place in the series, it is evident that, broadly, the loss of cyanogen through the formation of sulphocyanide is directly dependent on the ammonia present. While a high proportion of ammonia leads to a loss amounting to as much as 65 per cent., even a very small proportion of ammonia in the gas treated, in the presence of the ferrous oxide (which contained sulphur) used for the absorption, will result in a loss of as much as 12 per cent., as shown by sample No. 7. The percentage of prussian blue in the spent oxide rises in direct proportion to the decrease in the percentage of ammonia. Dr. Leybold proceeded from the consideration of these facts to investigate the underlying causes of the relations which he had observed. He made three experiments, with the object of correlating theoretical with practical conditions. These were (1) the passage of a mixture of hydrogen, hydrocyanic acid, and ammonia through oxide saturated with sulphuretted hydrogen; (2) a similar experiment to (1), but with the ammonia replaced by ammonium sulphide; and (3) the passage of a mixture of hydrogen, hydrocyanic acid, and ammonia through oxide which had been fouled and revivified, and then saturated with a solution of ferrous sulphate. The last-named experiment was conceived with a view to neutralizing the ammonia in the mixed gases. The results of these experiments are shown in the appended table, in which the several columns correspond in signification to those in the preceding table:—

Experiment No.	Ammonia.	Hydrocyanic Acid as		Hydrocyanic Acid Converted to Sulphocyanide.
		Prussian Blue.	Ammonium Sulphocyanide.	
1 (*a*)	2·05	0·966	1·076	53·0
(*b*)	2·08	2·010	2·220	52·0
2	0·75	3·040	1·560	33·5
3	0·89	1·876	0·927	33·1

* A Correction.—In the table given on p. 479 of the "Journal" for Feb. 24, the figures in the last line, representing the average yield of cyanogen products per ton of coal carbonized, are obviously incorrect. The figures in the original table of Herr Feld are 765, 1350, and 1842 grammes per metric ton; and these become, on conversion, 1·71, 3·02, and 4·12 lbs. per English ton respectively. There is a discrepancy in the original, in which, moreover, a very high yield of gas per ton of coal is assumed. A correspondent has pointed out that, on the assumption of a make of 10,000 cubic feet per ton, the yields per ton of coal are 1·59 lbs. of hydrogen cyanide, 2·81 lbs. of prussian blue, and 3·84 lbs. of potassium cyanide.—Ed. J.G.L.

These experiments showed that while in the presence of pure ammonia about half of the absorbed cyanogen was lost through the formation of sulphocyanide, yet in the presence of ammonium sulphide the loss was only about one-third, though the converse might have been anticipated. The third experiment further proved that, instead of the harmful effect of the ammonia being wholly disposed of by its neutralization by ferrous sulphate, the loss of cyanogen through the formation of sulphocyanide was actually just as high as when ammonium sulphide was present, and amounted to one-third of the hydrocyanic acid absorbed.

Evidently, clear information on the conditions of the formation of sulphocyanide must be of great importance in attacking the problem of cyanogen recovery; and it is necessary to consider in this connection the nature of the oxide, and the composition of the gas as it enters the purifiers. The oxide consists in practice of ferric oxide, sulphide of iron, and free sulphur. The sulphur, however, is present not only in the feebly active deposited form, but free sulphur is formed continuously under the influence of the ferrous oxide, which is present transitionally, through the action of the oxygen contained in the gas on the sulphuretted hydrogen. This sulphur is in a very active state—*i.e.*, in the nascent condition.

The constituents of the gas which are of importance are the following:—

Ammonia	=	3·5	ounces	per	1000	cubic feet.
Hydrocyanic acid	=	2·0	,,	,,	,,	,, ,,
Oxygen	=	2·0	,,	,,	,,	,, ,,
Sulphuretted hydrogen	=	20·0	,,	,,	,,	,, ,,
Carbonic acid	=	20·0	,,	,,	,,	,, ,,

It is assumed that the ammonia, though chiefly combined, is only loosely combined with carbonic acid and sulphuretted hydrogen. This mixture traverses the ammonia washers before it enters the purifiers. Seeing the strong disposition of ammonia to cause the formation of sulphocyanide, the latter might be expected as a product in the washer; but the essential agent for the production of sulphocyanide is not present there. This agent, as will be shown later, is—directly—free sulphur, but indirectly the iron compounds which cause the separation of the free sulphur. In fact, the circumstance that comparatively little sulphocyanide is formed in the ammonia washers signifies that ammonium sulphide, hydrocyanic acid, sulphuretted hydrogen, and oxygen do not by themselves act upon one another in the proportions in which they occur there. But if oxide mixed with sulphur is present, this mixture of ammonia, hydrocyanic acid, sulphuretted hydrogen, and oxygen behaves differently. The first of the three experiments of Dr. Leybold last quoted affords the explanation. The pure ammonia and hydrocyanic acid may enter into the reactions shown by these equations:—

[10] (*a*) $2NH_4CN + FeS = Fe(CN)_2 + (NH_4)_2S$.

(*b*) $(NH_4)_2S + S_2 = (NH_4)_2S_3$

(*c*) $2(NH_4)CN + (NH_4)_2S_3 = 2NH_4CNS + (NH_4)_2S$.

That is to say, the action of ammonium cyanide on the sulphide of iron is first of all to produce ferrous cyanide and ammonium sulphide. The latter is a powerful solvent of sulphur, and then becomes converted into polysulphide. The polysulphide is converted by direct reaction with more ammonium cyanide, to which it gives up sulphur, into ammonium sulphocyanide and monosulphide. This secondary mode of sulphocyanide formation is, by reason of the large surplus of free sulphur in the oxide, very much favoured.

(To be continued.)

COAL TAR AND ITS UTILIZATION.

By Dr. F. Schniewind.

[Extracts from an Article in "Mineral Industry," Vol. X.]

Tar is the product of the destructive distillation of organic substances, and according to the material subjected to this treatment there are produced: (1) Wood tar, obtained in the manufacture of charcoal; (2) oil tar, obtained in the manufacture of carburetted water gas and as a residue in the distillation of crude petroleum; (3) coal tar, produced in the destructive distillation of bituminous coal, chiefly in coke-ovens and gas-retorts (small quantities of coal tar are also obtained from blast-furnaces using bituminous coal, and from bye-products gas-producers); and (4) miscellaneous tars, which are obtained by subjecting various kinds of organic refuse to destructive distillation—as, for instance, bones in the manufacture of bone charcoal. Small amounts of an inferior tar are produced in this way. The following discussion is limited to coal tar only, including the product from coke-ovens and gas-retorts, and incidentally water-gas tar. The quantity of the other kinds of tar produced is so insignificant that it may be neglected.

The following table gives the world's production of coal tar and water-gas tar for the year 1901. Accurate figures are not obtainable; and the table has been compiled on the basis of the ammonium sulphate and gas produced in the various countries.

	Barrels of 50 galls.
England	4,000,000
Germany	2,600,000
United States	1,200,000
France	840,000
Belgium, Holland, Sweden, Norway, and Denmark	770,000
Austria, Russia, Spain, and other European countries	880,000
All other countries	1,000,000
Total	11,290,000

The United States ranks below both England and Germany in the total production of tar; and therefore a large increase would not be by any means so serious a matter as has been feared by those averse to the bye-product coking system. It is of interest, in this connection, to glance at the amount of tar and pitch imported into America, as given by the Bureau of Statistics of the United States Treasury Department. The figures (representing barrels) are as follows for the years named: 1895, 116,630; 1896, 141,515; 1897, 111,526; 1898, 88,603; 1899, 25,049; 1900, 74,385; and 1901, 37,959. Of the 74,385 barrels imported into the States in 1900, 71,980 barrels came from the United Kingdom. The extent to which the other derivatives of coal tar are imported into this country is also to be taken into consideration. These products—comprising benzol, toluol, carbolic acid, salycilic acid, aniline and alizarine colours and dyes, and numerous other technical and pharmaceutical articles—were imported to the value of $6,773,152 in 1900, on which duty to the amount of $1,516,689 was paid.

The English market reports as given in the "Journal of Gas Lighting" show that the average annual price of tar has varied from 1·57 c. to 2·27 c. per United States gallon since 1895, the average price for 1901 being 1·74 c.; and that pitch has varied from $5·73 to $10·47 per short ton, the average price for 1901 being $8·49. The prevailing price for the tar in the United States ranges between 2·5 c. and 3·5 c. per gallon in large quantities. The German prices are somewhat above the English prices, and approach the American figures. Large quantities of crude tar products are imported by Germany from England. Germany, as is well known, leads all other countries in the manufacture of refined tar products, as is instanced by the fact that one-third of the crude carbolic produced in England is sent to Germany for refining.

Crude tar varies considerably in its quality; the differences arising partly from the coal from which it is derived and partly from the method of distillation. The distinguishing characteristic of coke-oven tar is its low percentage of free carbon, which varies from 8 to 15 per cent.; while tar from gas-works commonly has from 20 to 35 per cent., and even more, due to the higher heat used in carbonization, which tends to destroy the hydrocarbons. The low percentage of free carbon in coke-oven tar increases its value for most purposes, especially in the chemical industry. Characteristic analyses of coke-oven tar and gas-works tar are given in the following table:—

Fractions.	Coke-Oven Tar.		Gas-Works Tar.		
	Dominion Coal (Everett).	Germania Plant (Westphalia).	German.	American.	
				Fair Quality.	Poor Quality.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Light oil	1·26	6·55	2·50	1·65	6·14
Middle oil	14·73	10·54	2·50	10·66	5·03
Heavy oil	7·07	7·62	25 00	8·18	7·50
Anthracene oil	21·38	44·35	10·00	14·05	11·71
Pitch	53·03	30·55	60·00	61·16	68·25
Water	1·52	Trace	..	1·81	..
Loss	1·01	0·39	..	2·48	1·37
Total	100·00	100·00	100·00	..	100·00
Free carbon	8–10	..	25	..	48·40
Sp. gr.	1·888	1 1198	1·155	..	1·255

Crude tar is used directly without further treatment for a variety of purposes; and a certain proportion of the production is absorbed in supplying these demands. A number of the smaller gas-works, particularly in England and the United States, find disposition for their whole product in local fields for painting, varnish making, pipe coating, dipping paving-brick and roofing tile, preserving stonework, concrete pavements, &c. The manufacture of tar varnish consists principally in heating the tar to drive out the ammoniacal liquor, which would corrode ironwork, and in thinning the tar by the addition of oil. The market for this product is limited, as a similar article, usually better adapted to its specific purpose, is made by the large tar-works, by mixing hard pitch and light oils with other ingredients to suit various requirements.

The use of crude tar as a fuel is also met with from time to time. Market conditions and the difficulties of transportation have in the past caused the burning of a great deal of tar; but of late years the development of the tar industry has precluded this. Numerous determinations have been made of the fuel value of tar for steam raising and other purposes. The theoretical calorific power of tar compared to coal has been estimated by

Mr. Dexter as 2 to 1. Lunge considers this value high, and cites a test by Mr. J. T. Lewis, showing a ratio of 7 to 5 between tar and coke burned under gas-retorts. Körting gives the theoretical value as 1 to 1·2, but states that the practical efficiency will favour the tar. Mr. C. F. Prichard gives the calculated calorific power of coal tar as 15,781 B.T.U. per pound, and coal as 14,385 B.T.U.—a ratio between the theoretical values of about 1·1 to 1; while the actual test showed that the evaporative effect was as 11·91 to 9·8, or a ratio of 1·21 to 1. The latter test Mr. Prichard does not consider as conclusive for the tar, but he believes that a ratio of 14 to 9·8 or 1·43 to 1 should be easily attained. This is practically the same as Mr. Lewis's ratio of 7 to 5 (1·4 to 1). Tar (or preferably tar oil), when burned in a specially constructed furnace with insufficient air supply, yields lampblack. The products of combustion are led through long brick passages before reaching the stack, and in these the soot is deposited. Lampblack is used in the manufacture of printers' and lithographers' ink, patent leather, and in making carbon electrodes.

Coal tar is ordinarily distilled by heating it in steel vessels enclosed in brickwork settings, which are provided with grates for burning coal. The vapours given off are condensed in a coiled pipe or worm immersed in water. The distillates flow into a small receiving-tank which discharges into storage-tanks provided for the different fractions; the oil usually being separated in accordance with its specific gravity. The pitch remaining is transferred from the still to the cooler, from which it flows into barrels when cooled to the proper temperature. The usual form of still is a horizontally-placed cylinder of boiler plate. The larger ones hold about 10,000 gallons, and the smaller ones are of various capacities down to 500 gallons. European tar distillers generally use a vertical still with concave bottom. In American practice, the distillates given off below 270° C. (518° Fahr.) are usually separated into light and heavy oils only—*i.e.*, oils of a lower or higher specific gravity than water. With the light oils, a more or less considerable amount of water is expelled, so they are collected in a storage-tank and separated after settling. It is not usual to separate the fractions more carefully, though in some cases redistillation of the light oil for naphtha, &c., is carried on. The heavy oils, or creosote oils, are used largely for the impregnation of wood and for the manufacture of lampblack.

In European works, the distillation is carried much further—*i.e.*, to a higher temperature than in the American plants; the object being to obtain the anthracene oil, which is the basis of the very extensive alizarine dye industry. The temperature is carried as high as 360° C. (680° Fahr.), which is about as high as the stills will stand. The resultant pitch, which is much harder than the American product, is run into depressed pitch floors to cool, and is afterwards broken up into pieces for shipment in bulk. It is chiefly used in the briquette industry. If a soft pitch is required, the hard pitch is remelted with heavy oil, or the heavy oil is added to the pitch while it is yet molten in the still. A large portion of the soft pitch used in England and on the Coninent is made in this way.

Numerous attempts have been made to avoid the difficulties incident to the operation of the ordinary intermittent tar-still by developing a continuous process, and a number of devices for the purpose are mentioned by Lunge in his "Coal Tar and Ammonia," of which those introduced and operated by Lennard in England, and Hirzel at Leipzig, appear to have met with some measure of success. The Lennard still has a capacity as high as 480 barrels per day.

Soft pitch is extensively used in paving, to fill the interstices in brick, stone, or wooden pavements. It is also employed to some extent in asphalte pavements. Pitch by itself is very much used in certain sections of the country as a binder for concrete, and it gives very general satisfaction where traffic is not too severe. A form of pavement called ta rmacadam has lately come into prominence. It is a combination of broken stone and soft pitch mixed hot and rolled in place under a heavy roller. Very good results have been reported from its use. The manufacture of fuel briquettes is the principal use for coal-tar pitch in England and on the Continent. The high price of fuel, and the fact that there are large quantities of fine coal of little or no value, have caused this development. It is possible that the increase in the number of bye-products coke-ovens, and the consequent larger supply of tar and pitch, together with the growing demand for a convenient and smokeless fuel, may cause the industry to make more progress in the United States than it has done hitherto.

The chemicals recovered from the distillation of tar are the benzols (50 and 90 per cent.), solvent and burning naphtha, pyridine bases, carbolic and cresylic acid, naphthalene, creosote oil, anthracene, &c. The development of the tar chemical industry has been carried farther in Germany than elsewhere, and the concerns engaged in it have been very prosperous.

Toxic Effect of Acetylene in Atmospheric Air.—According to the "Chemiker Zeitung," MM. Gréhant and Weyl de Franck have recently published the results of their studies on the effect of acetylene in the atmosphere on persons breathing it. According to their conclusions, the gas only acts injuriously when the proportion in the air amounts to 46 per cent., and can only act fatally when it reaches 79 per cent. When absorbed by the blood, even up to 10 per cent., it appeared to combine chiefly with the albuminoid constituents.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Suggested New Gas-Stove.

SIR,—The question raised by Mr. Cleverly in the "JOURNAL" for the 17th ult. (p. 417) is well worth careful consideration. Notwithstanding the fact that hundreds of thousands of gas-cookers of the ordinary hiring type are now in use, and that a gas-cooker of some kind is indispensable to all up-to-date housekeepers, those who have any experience in the placing of these in a house will assuredly agree that the great majority of them are obliged to be fixed under very adverse conditions, either for the "cook" or the "cooker"—a suitable place, other than that already occupied by the coal-range, not being available in the average kitchen. While the gas-cooker has therefore forced itself into use, in spite of all adverse conditions, by sheer obvious merit, it is still treated as an interloper, and is not taking the position as a permanent domestic fixture which its proved advantages by this time rightly claim.

The present position of matters in the planning and building of new property seems to be that, instead of provision being made for a gas-cooker which will probably be used, the regulation chimney opening is fitted with the regulation coal-range, having its buried maze of impishly-built flues around an oven which will probably never be used for cooking; and as, of course, very few tenants will undertake the trouble and expense of removing this "ancestor," and of having the recess finished neatly, and prepared to receive any self-contained apparatus which may be desirable, there it still stands because of the fire and the boiler, and perhaps because of the lack of a gas-range at a reasonable price capable of serving satisfactorily and permanently the combined purposes.

The present form of gas-cooker was, no doubt, the best with which to introduce to the public the great advantages of cooking by gas; yet it can but be considered as a link in the chain of progress, and consequently transitional in form. The near future will see important modifications in several respects. In the first place, the oven is far too low for comfortable and convenient working; and the stooping necessary to a busy housewife or servant who uses it constantly adds greatly to her toil. This should certainly be remedied. I am aware of the reason for this undesirable arrangement—viz., the provision of a boiling-table within the space occupied by the oven; but it will have to be reconsidered. The sooner the better. All working places should be as near to the natural working level as possible. This would cause the oven to be raised very considerably, and perhaps the boiling-table to be lowered. Effective and economical water heating must also be provided for, as well as a fire.

The time has surely arrived for the next important step to be taken towards the permanent substitution of gas appliances in place of "the passing conveniences of other days." One can readily understand the reluctance of makers to leave the forms which have served them so well—they being naturally anxious to make the best possible use of patterns and plant in hand. Yet why should they delay until others take up the matter, and make their position still worse? History shows the wisdom of being ever open to progressive developments. The suggestions of practical experience should be embodied as soon as possible.

It is not so very long since the present form of cooker was strange, and was looked upon with doubt. It has served its purpose well, and is now pointing the way to something still better, which is surely at hand. The probabilities are that they who first lay themselves out to satisfactorily meet the more complete requirements, untrammelled by the forms of the past, will reap the reward of their enterprise.

Gas authorities can do much to pave the way in this direction by practical demonstration and convincing educative literature. If their efforts result in making permanent what is in great measure still temporary, their part in providing a purer atmosphere and happier conditions of life will bring rich reward to them also.

W. H. SHERBURN.

Stockton Heath, Warrington, March 5, 1903.

Need of Efficiency in Gas Managers.

SIR,—Among the numerous noteworthy points in Sir George Livesey's interesting report on the Nottingham gas undertaking, given in the last number of the "JOURNAL," there is one that should not, I think, be overlooked by those who are, or aspire to be, in the position of leaders of men in business concerns. I refer to his *obiter dictum* drawing the necessary distinction between character and ability, and striking the true note for the manager of men—trust, not suspicion. "In all questions of character," says Sir George, "it is right to place confidence in a man, unless there is reason to believe him to be unworthy of confidence; but in matters of pure business, a man may justly and fairly be required to prove his capacity before being trusted with the absolute control of a great undertaking," or, indeed, I may venture to add, of any part of such an undertaking. This is the bed-rock principle of efficiency; and it is its disregard that is responsible for much of the obvious lack of efficiency to be observed in many walks of life, both national and industrial, at the present day. Good intentions and conscientious attempts to perform the allotted task are considered as sufficient reasons for not visiting with punishment or dismissal futile and incompetent persons who have been entrusted with important work, and have made a hash of it. In other words, character has been accepted as a substitute for ability; and Sir George does good service in pointing out the necessity of requiring ability where ability is needed, and seeing that you get it. So-and-so may be a very good fellow, and may try his utmost to give satisfaction; but if he does not, he must give way to the man who has the power as well as the will to achieve success.

"It is right to place confidence in a man, unless there is reason to

believe him to be unworthy." There speaks the man who will get others to serve him to the uttermost. Confidence sows its own harvest; and so does suspicion. Let men feel you trust them, and that you are relying upon them to do behind your back as good work as they would do before your face, and you will get the best possible results out of all the men who are worth retaining in your service. You will soon find out the others, and, when you do, get rid of them without hesitation. The man you have to watch and check because you suspect him, you can very well do without. If, on the other hand, you start on the cynical line of believing no man honest till he has proved himself to be so, you will drive away, or hopelessly discourage and dishearten, the honourable servant, and breed lazy and dishonest "dodgers" more than enough to "justify" your original suspicions. These reflections, called up by the parenthetical remark of Sir George Livesey, may be commended to the consideration of all gas managers, for there is more involved in this question of the mental attitude of the superior towards his subordinates than many people realize.

Now that I am on the subject of the postscript to the Nottingham report, perhaps I may be permitted to draw attention to another point, whereon Sir George Livesey lends support to a contention frequently urged in the "JOURNAL"—namely, the need of making full use of the competent young men in any business before they grow old, rusty, and discouraged. "I have not the slightest objection to a young man being placed in a responsible position," says one of the oldest men occupying the highest position in the gas world; though it is always difficult to think of, and would really be inaccurate to describe, Sir George Livesey as an old man, for he is one of those ("exceeding rare," as Bacon truly says) who "have kept themselves open and prepared to receive continual amendment," and "have not suffered themselves to fix." He adds, however, the obvious condition, "if he [the young man] has the necessary capacity, knowledge, and experience—the last being an important qualification for the management of a large gas undertaking." But, some say: How can a young man have the necessary experience? Bacon may again be quoted for the answer: "A man that is young in years may be old in hours, if he have lost no time. But that happeneth rarely." Rarely, it is true; but then first-class men, whatever be their age, are only too rare; and the man who is ever going to be really capable of managing a big business will be fit to do so long before most undertakings will give him the chance. That sort of man does not "lose time." I would say then: Get the best men; get them young; give them good work to do, and trust them to do it; and you will soon find you can entrust to them the highest positions, and that they will do credit to themselves and to those who had the courage and judgment to choose them.

March 5, 1903. F. G. N.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time: Belfast Water Bill, Bournemouth Gas and Water Bill, British Gaslight Company (Norwich) Bill, Chard Corporation Gas and Electricity Bill, Faversham Gas Bill, Harrogate Water Bill, Hexham Gas Bill, Nantwich Gas Bill, Nantwich Urban District Council Bill, North-Western Electricity and Power Gas Bill, Oldham Corporation Bill, Plymouth and Stonehouse Gas Bill, Rickmansworth Gas Bill, Scunthorpe Urban District Water Bill, Torquay Corporation Water Bill, Wellington (Salop) Gas Bill.

Petitions have been presented against the following Bills: Bury and District Joint Water Board Bill, Hexham Gas Bill, Nantwich Urban District Council Bill, North-Western Electricity and Power Gas Bill, Oldham Corporation Bill, Plymouth and Stonehouse Gas Bill, Rickmansworth Gas Bill, Wellington (Salop) Gas Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Barnsley Corporation Water Bill, Bath Corporation Water Bill, Ebbw Vale Water and Improvement Bill, Hyde Corporation Bill, Nantyglo and Blaina Water Bill, Nelson Corporation Bill, New Hunstanton Improvement Bill.

Petitions have been presented against the following Bills: Bath Corporation Water Bill, Commercial Gas Bill, Crystal Palace District Gas Bill, East Ardsley Gas Bill, Ebbw Vale Water and Improvement Bill, Gaslight and Coke Company Bill, Gaslight and Coke Company's Acts Amendment Bill, Hampton Court Gas Bill, Kent Water Board Bill, Leigh Corporation Bill, London County Council (General Powers) Bill, Market Drayton Gas Bill, Merthyr Tydfil Urban District Council Bill, Nantyglo and Blaina Water Bill, New Hunstanton Improvement Bill, North Middlesex Gas Bill, Sutton District Water Bill, Walker and Wallsend Union Gas Bill, West Sussex Water Bill.

The second reading of the Bill of the Gaslight and Coke Company, which stood for yesterday, was opposed by Mr. Lough.

Water-Meters in Cambridge (Mass.).—The Water Board of Cambridge (Mass.), in their last annual report, unanimously recommend the immediate installation of a complete meter system; and to that end they advise the appropriation of $25,000, to be charged to the water-works construction account, and met by an issue of bonds to be paid out of the revenue. This sum will probably provide for all the meters that the Board can set during the year.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Friday, March 6.

(*Before Lords Justices* VAUGHAN WILLIAMS, STIRLING, and MATHEW.)

Gaslight and Coke Company v. Cannon Brewery Company.

This was an appeal by the plaintiffs from the decision of the Divisional Court, consisting of the Lord Chief Justice and Justices Darling and Channell* confirming his Honour Judge Edge, who entered judgment for the defendants in an action brought to recover £10 1s. 3d. for arrears of gas supplied to premises at No. 388, Harrow Road to the then tenant, Mr. Lowles, who carried on the business of a grocer with an off-licence for the sale of wines, spirits, &c. The question, it may be remembered, turned upon section 18 of the Company's Act of 1872, which provides that: "In case any consumer leaves the premises where the gas was supplied to him without paying to the Company the rate or meter-rent due from him, the Company shall not require from the next tenant of the premises payment of the arrears so left unpaid, unless the incoming tenant shall continue the trade or business of the outgoing tenant, and shall have paid to the owner, lessee, or mortgagee in possession, or to the outgoing tenant of such premises, a consideration for so doing." The tenant being in arrear for goods supplied to him, and on the mortgage, the latter was transferred to the Cannon Brewery Company who, the plaintiffs alleged, were liable to pay the arrears due for gas.

Mr. DANCKWERTS, K.C., and Mr. VAUGHAN WILLIAMS appeared for the appellants; Mr. A. H. SPOKES represented the respondents.

At the conclusion of the arguments,

Lord Justice VAUGHAN WILLIAMS said the question the Court had to decide was whether or not, having regard to the terms of section 18 of the Company's Act of 1872, the appellants had a right to sue a successor on premises for arrears left unpaid by his predecessor in cases falling within the exceptions introduced by the word "unless." The section provided that, in cases where the consumer left premises where gas was supplied without paying the gas-rent or meter-rent, the Company should not require from the next tenant of the premises payment of the arrears so left unpaid, unless the incoming tenant agreed with the defaulting consumer to pay the arrears, or unless the incoming tenant should continue the trade or business of the outgoing tenant, and should have paid to the owner, lessee, or mortgagee in possession, or to the outgoing tenant, a consideration for so doing. It had been argued on behalf of the respondents that the word used in this section was not "recover" but "require," and that with regard to the cases falling within the section introduced by the word "unless" the right of the Gas Company was not to recover, under sections 70 and 71 of their Private Act of 1868, these arrears, but merely to insist on the payment of the arrears as a condition precedent to any future supply. And in support of this argument, Mr. Spokes had called attention to the case of *The Gaslight and Coke Company v. Mead*, decided by Justices Blackburn and Lush, which was said to be a direct authority in favour of the respondents. The Judges in the Divisional Court having upheld this view, it became necessary now to consider whether or not the decision of the Court of Queen's Bench was right. In his judgment, the decision was not right. It was said that a decision given in 1876 ought not to be lightly overruled; but if, when one came to look at the decision, he arrived at the conclusion that it was wrong, effect should clearly be given to that conclusion. In Mead's case, Justice Blackburn said: "Under 10 Vic., cap. 15, there was no compulsory enactment for the supply of gas, but a permissive power. Then it was provided that if the consumer did not pay, his supply might be cut off. Then, under 23 and 24 Vic., cap. 125, sections 14, 15, and 16, supply was compulsory, but you must make a contract; and section 39, upon that state of things, was inserted in favour of the incoming tenant providing that his supply should not be cut off for his predecessor's arrears, unless he had agreed to pay them." Justice Blackburn assumed that section 16 of the Act of 1847 gave a right to the Gas Company to cut off the supply to the successor for the predecessor's arrears; but if the section was looked at, it would be seen that it gave no such power. The section provided that, if any person supplied with gas by virtue of this or the Special Act neglected to pay the rent due for the same, the undertakers might stop the gas from entering the premises of such person by cutting off the service-pipe, or by such other means as the undertakers should think fit. This section did not give the power of cutting off the gas from the premises of an occupier by reason of the default of his predecessor. When one came to the Act of 1860, where the case of a predecessor and successor was dealt with in section 39, it was provided that, in case any person left the premises without paying the rate or meter-rent due from him, the Gas Company should not require from the next tenant of the premises payment of the arrears so left unpaid, unless the incoming tenant agreed with the defaulting consumer to pay the arrears; and the Gas Company should, notwithstanding any such arrears, in the absence of collusion between the outgoing and incoming tenant, supply gas to the incoming tenant. The result of the combined Acts was this—that in all cases the Gas Company were bound to supply the occupier of premises, notwithstanding arrears were due from the predecessor in respect of gas supplied, in the absence of collusion between the incoming and outgoing tenant. He referred to these words so as to enable him to deal with the argument of Mr. Spokes that the intention of section 18, by using the word "require," was to enable the Gas Company to impose the payment of arrears, by the then occupier, as a condition of being supplied. But the real truth of the matter was that the Gas Company

* See "JOURNAL," Vol. LXXIX., p. 967.

had no such power. The only case in which the Gas Company could, by reason of non-payment of arrears, refuse to supply the then occupier with gas, was the case where he acted in collusion with his predecessor—by which he understood that a person must, in concert with his predecessor, be doing something to prevent the Gas Company recovering, where the succession was not a real succession. Under these circumstances, it seemed plain that the Gas Company would have really no effective means of imposing this condition. It was plain they could not use as a lever to compel payment of the arrears a refusal to supply the occupier with gas, because the words at the end of section 18 compelled them to give a supply. Under these circumstances, one must give some meaning to the word "require;" and the only reasonable meaning was that given by Lord Justice Rigby in *Paterson v. The Gaslight and Coke Company*. He quite agreed with the Lord Chief Justice that the observations of Lord Justice Rigby were simply *obiter*, and could not be treated as a judgment on the point. Lord Justice Rigby stated in the clearest way that his view was that the Gas Company had a right of proceeding against the occupier for the arrears of his predecessor. In so holding, no hardship was inflicted upon the successor in this case—in fact, it would be a very much more harsh procedure if the Gas Company were entitled to refuse to supply the occupier with gas, or to cut off the supply. The Act made the supply of gas compulsory, and only relieved the Company from supplying in the case of collusion between the outgoing and incoming tenant; and it would have been very unreasonable to leave the Gas Company without any remedy at all. There was no real remedy left to the Gas Company, unless one read the word "require" as governing "recover," and having personal recourse to the then occupier for the arrears of his predecessor. Under these circumstances, he had come to the conclusion that they ought not to follow the decision in Mead's case.

Lord Justice STIRLING said the case was certainly not free from difficulty, whether the simple language of the Act was regarded, or the cases in which the section now in question had been considered by the various Courts before whom the cases relating to it had been brought. It was no doubt an extraordinary and unusual thing on the part of the Legislature to enact that a person who had not incurred a debt should be held liable to pay it; but, nevertheless, there might be cases in which justice required that this should be done. What the Court had to see was that the language was sufficient to entitle it to hold that that intention was to be attributed to the Legislature in the present case. It was unnecessary to read the section at length again; but it provided that, where an outgoing tenant had left the premises with an arrear due to the Gas Company in respect of the supply of gas, the Company were not to require from the next tenant payment of the arrears, with the exception of two cases, one of which they now had to consider. The question was whether the section imposed an obligation on the incoming tenant to pay the arrears in the two excepted cases, or whether the payment of the arrears formed a condition precedent to the supply of gas to the incoming tenant. The argument on behalf of the respondents was that, unless the Company insisted on not supplying gas until the arrears had been paid, they had no other remedy. That was to say, even if the incoming tenant required a supply, and the Company proceeded to supply it, the incoming tenant was not liable—that the only right of the Company was to refuse to supply, and so put pressure on the incoming tenant. He did not think this was the fair consequence of the language used, and for that he had the opinion, in the first place, of Mr. Justice Lush in Mead's case, who said: "If we were only to look at the construction of the Company's own Private Acts without reference to previous legislation upon the subject in the Public Acts which are incorporated with them, the inference would be an obvious one—that the liability existed in this case, which the Magistrate could enforce." The opinion of Lord Justice Rigby in *Paterson v. The Gaslight and Coke Company* was certainly to the same effect; so that they had the opinion of two learned Judges on the natural meaning of the language of the section. It was said that the history of previous legislation showed that the right was only to abstain from supplying; but, in the first place, there seemed great difficulty in so holding upon the language of the section itself, because the provision was that the Company should, notwithstanding any such arrears, in the absence of collusion between the incoming and outgoing tenant, supply gas to the incoming tenant on being required to do so—that was to say, in the absence of collusion gas should be supplied on the Company being required so to do. The rational construction seemed to be that the Company should give a supply on the one hand, and that the tenant should become liable for arrears on the other. When the grounds of the decision in Mead's case were looked at, it appeared that they rested on this—that there existed under the prior Acts a right on the part of the Company to cut off the supply. The only right to cut off the supply which existed under the prior legislation was that conferred by section 16 of the Gas-Works Clauses Act, 1847. This appeared to be limited to the case where the premises on which the gas was supplied were those of the person who had been supplied with gas, and was inapplicable to a case like the present one. He thought that the reasoning of the learned Judge in Mead's case was less satisfactory than that of the Lord Justice Rigby in Paterson's case.

Lord Justice MATHEW gave judgment to the same effect.

The appeal was therefore allowed.

Mr. SPOKES submitted that this was not a case for costs. The Gas Company merely desired to get the decision in Mead's case over-ruled. It made no difference to the brewers whether the case stood or no.

Mr. DANCKWERTS: What about all your other public-houses?

Lord Justice VAUGHAN WILLIAMS: Your appeal must be to Mr. Danckwerts. He is entitled to his costs.

Mr. DANCKWERTS: Then I ask that the appeal be allowed, and with costs here and below.

Lord Justice VAUGHAN WILLIAMS: Yes.

The Directors of the Shanghai Water-Works Company, Limited, announce that a final dividend for the past year of £1 12s. 6d. per share will be paid on the 25th inst., an interim dividend of 15s. having been paid last July.

DURHAM WINTER ASSIZES—Wednesday, March 4.

(*Before Mr. Commissioner* LAWRENCE, K.C.)

South Shields Corporation v. South Shields Gas Company.

This was an action brought by the South Shields Corporation against the South Shields Gas Company to recover the sum of £227 14s. 8d. for damage done to their property by an explosion of gas in Commercial Road, South Shields, on the 11th of January last year. The case was originally entered for hearing before a Special Jury; but, as the matters in dispute were merely questions of law, the parties agreed to have the action tried without a Jury, on the understanding that a suggestion of negligence was withdrawn.

Mr. MACASKIE, K.C., and Mr. MITCHELL-INNES appeared for the plaintiffs; Mr. SCOTT FOX, K.C., and Mr. BRUCE WILLIAMSON represented the defendants.

Mr. MACASKIE, in opening the case, said the Corporation of South Shields obtained in 1891 a Provisional Order by which they were authorized to lay electricity supply mains and fix boxes in their streets. Mains were accordingly laid in Commercial Road and other places in the borough, and were carried under the footway of the streets by two four-way conduits and by an iron pipe. On the 11th of January last year, about eight o'clock in the morning, there was an explosion of gas caused by a spark from the switch of the incandescent lamp or lamps on an arc-lamp pillar near Trinity Church. It blew off the covers of the boxes and damaged the culverts to the amount altogether of £227 14s. 8d., which was the sum sought to be recovered. On investigation, it was found there had been an escape of gas from the mains at the end of Commercial Road. The gas-mains had had, through some means about which there would be no substantial dispute, a disused service-pipe broken off; and this pipe was laid by the Company. In May, 1901, Mr. Harper, a builder, was employed by the people who owned or occupied the Seamen's Mission Hall to connect their drains with the main sewer. Regulations had been framed by his clients in respect to the mode in which the connections were to be made between the drains and the sewers under section 21 of the Public Health Act, 1875. Among other things, it was provided that, before commencing the work, permission in writing should be obtained by the builder, and notice given to the Borough Engineer; and by the second regulation the work was to be carried out under his control. On the 24th of April, he issued the usual printed permission. Counsel proceeded to quote several decisions to show that the Company were liable for the damage resulting from the explosion. He contended that the Company distributed their gas at their own risk, with the possible exception of an act of God; and though they themselves were not the cause of the injury to the service-pipe which resulted in the explosion, they were nevertheless liable. Among other cases were those of *Fletcher v. Rylands* and *Batcheller v. Tunbridge Wells Gas Company*.

Evidence was then called in support of the plaintiffs' case.

Mr. *S. E. Burgess*, the Borough Engineer and Surveyor of South Shields, stated that in 1901 Mr. Harper applied in person at his office for permission to open the Commercial Road, near the Seamen's Mission, for the purpose of connecting a 4-inch pipe drain with the main sewer. Permission was granted, and the work was carried out in July, under the supervision of Mr. Sloane, the drainage inspector. In consequence of a report from Mr. Sloane, notice was given to Mr. Harper to permanently put in order the paving over his drain trench. The inspector was left to see that this was done. In the afternoon of the day of the explosion, he visited the place, and found that the Gas Company's men had made a hole opposite the Mission. He came across the gas service-pipe, which had been broken off short at the main, and had been plugged.

In cross-examination by Mr. SCOTT FOX, witness said that, in his opinion, Mr. Harper had done his work properly. He did not think he had ever made a claim upon him, though he could not say definitely that none was made. His (witness's) duty lay with the sewers and highways. It was quite possible to make a good job of this, if sufficient care was taken.

Mr. SCOTT FOX: Was the breakage caused by the excavation not being properly filled in?

Witness: No. All the soil that was taken out was replaced, and the excavation properly filled in.

If it was properly filled in, and all the material replaced, how did it go down?—I understand it was properly filled in; I did not see it.

Mr. SCOTT FOX said that, according to the plaintiff's case, the spark did not ignite the gas until it was a quarter-of-a-mile off. Even supposing the defendants were liable, and that they were in default in law because they allowed the gas to go into the subsoil, what would be the natural consequences? If the gas went into the subsoil it would come to the surface, and the inspector would be able to detect and remedy it before it did any damage. He contended that the plaintiffs were negligent in not ventilating their conduits in such a way that if any gas escaped it would be let out at the place and be at once detected, instead of being carried some distance away.

Mr. MACASKIE said he did not think there was any obligation to put in apparatus for the purpose of ventilating the boxes.

The COMMISSIONER said he had not heard that the Corporation were bound either to ventilate or to keep their mains impervious to gas for the purpose of protecting the Gas Company.

Mr. SCOTT FOX: Not for the purpose of protecting the Gas Company, but to avoid an accident.

In reply to further questions, witness said the trench was properly laid; but the ground was unstable on account of its being made with ballast and ashes.

Mr. *James Sloane*, the inspector, said he visited the work twice daily on three days. All the material taken out was put back, and the ground was well rammed and watered. In July the paving went slack, and Mr. Harper repaved it permanently. It was not his duty to give directions as to how a trench was to be filled in.

Mr. SCOTT FOX: If all the material was put back, and, in addition,

some concrete and a pipe put into the trench, what could make it less tight than it was before?

Witness: The traffic going over it.

Mr. *J. H. Cawthra*, the Borough Electrical Engineer, said he was on the scene of the explosion fifteen minutes after it occurred, and smelt the gas. The cause of the explosion was the breaking of the gas service-pipe—the gas passing up the conduits, filling the arc chamber, and being fired by the action of the incandescent switch. He examined the place and found that the electric conduits had fallen, and had opened at the joints in consequence of the drop.

Mr. MITCHELL-INNES: It is contended that your electric system is not constructed on the block plan?

Witness: You mean, by what is known in the business as the solid system. It is an open question which is the better. Our system is approved by the Board of Trade.

It is said that it causes insufficient ventilation?—That is another question with which you are left pretty much to yourself.

Mr. SCOTT FOX: You have had experience of electric light. Do you know that this danger of gas getting into the conduit is a well-recognized one?

Witness: Yes.

And it is recognized as impossible to quite prevent accumulation in the subsoil?—It is pretty generally recognized; and also that it is impossible to avoid stray leakages.

As a matter of fact, should not your conduits be made so air-tight that they will not let any gas in?—If the joints were properly made they would not let gas in.

Is it not difficult to seal them entirely, and, whatever care you take, is there not a probability of some leakage into your conduits?—The only defect would be in the conduits dropping. This is one of the contingencies engineers have to contemplate.

How it is, if there is not heavy traffic, and this place was so well filled up by the contractor, who got in more earth than he took out, that the conduits broke?—The joint parted. The fracture, in my opinion, was done by a pick in opening up after the explosion.

What caused the drop?—It was due to the trench, which must have consolidated somewhat.

John Oliver, a lamplighter, said on the morning of the accident he switched off the incandescent lamps. While closing the door, he heard a strange noise, and noticed a flash of flame.

Other witnesses were called, and the hearing of the case was adjourned.

Thursday, March 5.

On the resumption of the proceedings this morning, evidence was given for the defendants.

Mr. *James Swinburne*, examined by Mr. SCOTT FOX, said that, in his opinion, it was practically impossible to prevent an escape of gas from the mains into the subsoil as the result of casual accidents, and sometimes even without them. If these leakages were collected and carried to one spot, there was imminent danger of explosion if a light happened to be applied. He considered it was impossible to make conduits either gas or air tight; and, as a rule, there were settlements of the subsoil from time to time which aggravated the trouble in regard to leakages. How far settlement disturbed the tightness of the mains depended upon the system of jointing used.

The COMMISSIONER: And increased the chances of an incursion of gas into the conduits?

Witness: Yes.

Mr. SCOTT FOX: Where electrical conduits and gas-pipes are laid side by side, some gas is certain to get into the conduits; and any competent electrical engineer would be aware of the danger?

Witness: Yes.

Any competent engineer would recognize this inevitable danger in arranging the system?—He certainly ought to know the danger.

It was obviously, then, a source of danger to have a sparking switch in connection with the system?—Yes; the only thing more dangerous would be to substitute a naked light for the sparking switch.

Cross-examined by Mr. MACASKIE, witness said there were microscopic leakages from gas-mains; and whether or not an explosion would follow them must, of course, depend on the quantity of gas which escaped at the point or points of the leakage. He did not know of any case where natural or inevitable leakages caused so great an explosion as the one in the present case. So far as the conduits were concerned, he had no fault to find. They were known as "Sykes's patent." They had never been forbidden by the Board of Trade. It was a very difficult matter to ventilate electrical conduits; but one way of doing it was by free ventilation with intake and outlet shafts. Broadly, the question of how to ventilate was a very vexed and difficult one. The Board of Trade had never so far prescribed any particular method.

Mr. MACASKIE: It is a question that is very much debated by electrical engineers?

Witness: It ought to be; but I do not think it receives the attention it should.

The COMMISSIONER: Are there throughout the country appliances for ventilating conduits?

Witness: Occasionally there are such appliances in connection with these conduits. But sometimes there are none; and, as a rule, they are never adequate.

Mr. SCOTT FOX, on behalf of the defendants, said this was an action for damages brought by suppliers of electricity against a Gas Company. The two parties were, in some respects, in rather a similar position, because they each dealt with what he might call a dangerous agent, and each did it under statutory authority. If the doctrine laid down in *Fletcher v. Rylands* applied at all to such undertakings, it applied as much to the plaintiffs as to the defendants. The plaintiffs, for their own purposes, had chosen to obtain parliamentary powers to bring electrical energy into their mains and on to the public highway. If it was true that they must, at all hazards, prevent its escape, then they had not done this, because their act was the last one which caused this catastrophe—namely, the emission of a spark which set fire to the gas; and therefore he ventured to submit that they were guilty of negligence. Supposing the gas was the trespasser—that it got through the crack where the fracture took place—what did the plaintiffs do? They created a system which in fact collected the gas, which otherwise would not have caused the explosion. Supposing it was wrongful on the defendants' part to let out the gas, the explosion would not have occurred had it not been that the plaintiffs collected it, and carefully took it to the place where the accident happened. He contended that the accident was the consequence of the undertakers making their conduits 600 yards long, and collecting in them escaping gas which would otherwise have been detected. The plaintiffs had so contrived their system that the conduits carried the gas to a sparking switch, and so an explosion had occurred.

The COMMISSIONER, in giving judgment, said the case was, no doubt, interesting to lawyers; but he had come to a conclusion on the point, and, in his view, the action must fail. It was admitted that there was no negligence, yet plaintiffs were seeking to say that the persons who had statutory powers for everything they did, and against whom they could not allege any default whatever, were to be liable for damages caused by an act of their own. He thought the contention was erroneous. It was clear that a trench which had been inadequately filled in had caused a subsidence of the soil and a fracture of the conduit, and that therefore the Corporation, having the supervision of this work, were the authors of their own wrong. The trench was so imperfectly filled in that on the 2nd of July Mr. Harper was required to remedy the dangerous condition in which his work then was; so that a month had been sufficient to indicate the inadequate doing of the work. It was done again, and afterwards the pressure upon the top had caused the fracture. On the whole of the facts, he was of opinion that the cause of the accident was the inadequate way in which the trench had been filled, and that the work was not properly supervised by the officers of the Corporation who had the supervision of it. He therefore thought the Corporation had themselves to thank for the mischief that occurred—in fact, they were the authors of their own wrong, and could not recover from the defendants the damages sustained by reason of the explosion. Judgment would therefore be given for the defendants, with costs.

Rating Appeal by the New River Company.

Last Tuesday, at Hertford, the Court of Quarter Sessions sat to hear an appeal by the New River Company against the Hertford Union Assessment Committee, in respect of a rate made in January, 1900, increasing the rateable value of an intake across the mouth of the Manifold Ditch, between Hertford and Ware, from £650 to £3830. The appeal was originally heard in October, 1900, when the Court of Quarter Sessions dismissed it. The Company then went to the Divisional Court, who allowed the appeal. The Assessment Committee thereupon took the matter to the Court of Appeal, who allowed the appeal, but sent the case back to Quarter Sessions for rehearing and determination. On behalf of the appellants, it was contended that the old rate of £650 covered any enhanced value the intake possessed by reason of its fitness for the user made of it in taking water from the River Lea, and that 3s. 8d. per annum was the maximum rateable value of the intake, which measured only 3 poles. On behalf of the respondents, it was submitted that the true test was the price which a hypothetical tenant would be willing to pay to a hypothetical landlord to avoid being "turned out." Evidence was given by Mr. Joseph Quick, M.Inst.C.E., that if the Company were obliged to employ some other means of obtaining water, it would involve an additional expense to them of over £10,000 per annum. It was also proved by Messrs. Ryde, Eve, and W. Jones, Surveyors, that the Company were entitled to take 22½ million gallons of water per day through the intake; that their profit from this source alone was £300,000 per annum; and that in these circumstances a hypothetical tenant would readily pay the extra rate demanded. The Court dismissed the appeal, and refused to state a case or give the grounds of their decision.

The Lighting of Cudworth.—A scheme having been drawn up by Mr. W. W. Hutchinson, the Engineer of the Barnsley Gas Company, for the supply in bulk of gas to the neighbouring township of Cudworth, an inquiry has been held by Mr. F. H. Tulloch, on behalf of the Local Government Board, into the application of the Urban District Council for a Provisional Order to authorize them to raise money for the supply of gas for public and private purposes. The cost of carrying out the necessary works for the distribution of the gas is estimated at £6000; and the agreement with the Company is for seven years. Mr. Hutchinson informed the Inspector that the Company were assured they had the requisite power to undertake the supply of gas to the township. Their Act provided for the supply of gas in bulk in their own district; but there was no reservation to prevent them supplying within their limits gas to be consumed outside.

Reductions in Price.—The Wellingborough Gas Company, Limited, will at the close of the current quarter reduce the price of gas supplied in the town by 1d. per 1000 feet, and, owing to increased consumption, by 3d. per 1000 feet in the Earls Barton district. The Doncaster Corporation have decided to reduce their price by a similar amount—from 2s. 9d. to 2s. 6d. per 1000 cubic feet. The "Doncaster Gazette," commenting upon this fact, says: "The high price of gas in Doncaster, considering the proximity of great collieries and railway and water carriage facilities, has been a source of considerable public complaint for some time. The profits realized have gone into the borough fund; but the position has been that gas consumers have had to pay more than is necessary for the advantage of the ratepayers generally, and we do not think this is sound policy, particularly as high charges for gas are an incubus upon the trading and industrial enterprises of the town, as well as upon private consumers."

MISCELLANEOUS NEWS.

LONDON COUNTY COUNCIL AND GAS TESTING.

Proposed Departmental Committee.

At the Meeting of the London County Council to-day, the Parliamentary Committee will present the following report:—

We have had under consideration the various Gas Bills affecting London promoted in the present session of Parliament, and our attention has been called to the fact that upon no less than five Bills the question of the method by which gas should be tested is, or may be, raised. The Bills are the following: (1) The Commercial Gas Bill, which is promoted merely with the object of seeking for the Company a method of testing similar to that provided in section 6 of the South Metropolitan Gas Act, 1900. (2) The London County Council (General Powers) Bill, which by clause 54 seeks to repeal section 6—relating to gas testing—in the South Metropolitan Gas Act, 1900. (3) The Crystal Palace District Gas Bill, which seeks by clause 11 (*b*) to obtain for the Company testing provisions similar to those sought in the Commercial Gas Bill, and to those contained in the South Metropolitan Act, the repeal of which the Council is now endeavouring to secure. (4) The Gaslight and Coke Company's Acts Amendment Bill, promoted by the Council, which seeks, among other things, to reduce the illuminating power of the Company's gas from 16 to 14 candles, and in which, should that reduction be granted by Parliament, the Company may seek to get inserted testing provisions similar to those in the South Metropolitan Act referred to. (5) The Gaslight and Coke Company's Bill, upon which similar questions may be raised.

Section 6 of the South Metropolitan Gas Act, 1900, after stating that the burner for testing the gas should be Sugg's "London" argand, requires that "the burner in making such testings shall be so used that the gas shall be burnt at such a rate as to give a light equal to 16 candles." These words raise the whole question on this point. It is contended that testing the gas in the way required in this Act results in the gas appearing about one candle better than if it were burnt at such a rate as to give a light equal to 14 candles. When the Commercial Gas Company last year introduced the Bill for their Act of 1902, which authorized the reduction of the illuminating power of their gas from 16 to 14 candles, they also introduced a similar testing provision to that in the South Metropolitan Act. The Council opposed this provision, and the Company agreed to withdraw it; and consequently their gas is still tested in accordance with methods prescribed in the Commercial Gas Act of 1875, and the Gaslight and Coke and other Gas Companies' Acts Amendment Act, 1880.

It thus appears that there are now applying in London two statutory methods for testing 14-candle gas which really differ in result to the extent of about one candle; and therefore it seems that, before any of the further powers on the subject now being sought are considered, it will be desirable to have laid down authoritatively what is the proper method of testing the gas. Mention may here be made of the fact that when the South Metropolitan Company introduced their Bill containing the provision in question, the original proposal in the Bill was to permit the Company to supply gas of an illuminating power varying from 14 to 17 candles, and to allow an average to be taken. The testing provision as now contained in the Act seemed less open to question, if the gas was to vary above and below a 16-candle standard. Parliament, however, decided that there should not be a supply of gas varying in illuminating power, but that there should be a fixed standard of 14 candles. There was no argument or evidence before Parliament as to what would be the effect of testing 14-candle gas by a 16-candle test, and indeed it may be doubted whether the effect of it was fully appreciated at the time by any of the parties concerned.

It appears to us that the present position is anomalous, and that the question is one which ought to be dealt with uniformly throughout London. In view, however, of the fact that one of the Companies has existing statutory powers which the others have not, that the various Bills in Parliament this session affecting the question may not all be dealt with by the same Select Committee, that the matter is a scientific one, and that it is very doubtful whether a satisfactory and uniform basis of settlement would be arrived at by means of contests before Parliamentary Committees on the present Bills, we have thought it well to address a communication to the President of the Board of Trade, asking him to appoint a Departmental Committee to consider the matter. We have suggested that, in the event of the President seeing his way to adopt this course, the Bills and clauses now before Parliament, so far as they affect this question, should be withdrawn, in which case it would be necessary for the Council to withdraw clause 54 from its General Powers Bill. It appears to us that by this means parliamentary contests involving considerable expenditure, and possibly ending in unsatisfactory results, might be avoided, and that the appointment of a Departmental Committee would probably lead to the adoption of a uniform and equitable basis.

We have also suggested that the question of testing for sulphur and its compounds should be considered by the same Committee. This matter arises in particular on clause 11 (H) of the Crystal Palace District Gas Bill, which seeks to abolish all testing for sulphur so far as concerns that Company. We have communicated with the Public Control Committee on the subject; and in view of the present position of Bills in Parliament, it has been necessary to take immediate action in the direction above indicated, and we recommend—"That the action taken by the Parliamentary Committee in asking the President of the Board of Trade to appoint a Departmental Committee to consider the question of gas testing be approved."

Flooding of the Coleraine Gas-Works.—During the storm which raged over the North of Ireland recently, the River Bann overflowed its banks; and the Coleraine Gas-Works suffered seriously from the consequent floods. The fires in the retort-house were quenched, but fortunately the retorts themselves escaped.

PROVINCIAL GAS AND WATER COMPANIES.

GAS.

A Big Increase at Sutton.

At the recent half-yearly meeting of the Sutton (Surrey) Gas Company, the Directors reported that the gas consumption in the six months ending Dec. 31 had increased by 4,570,000 cubic feet, compared with that of the corresponding period of the previous year. The price of gas to the ordinary consumers had been reduced by 3d. per 1000 cubic feet as from June. The revenue from cooking and heating stoves had augmented by £200; and the Directors had revised the charges for these stoves with a view to popularizing their use.

Good Progress at Littleborough.

At the recent half-yearly general meeting of the Littleborough Gas Company, the accounts for the six months ending Dec. 31 showed a profit of £1417, and a disposable balance of £3017. In comparison with the corresponding period of the year 1901, the sales of gas showed an increase of £120, and the sale of residuals one of £96. The total make of gas was 55,564,800 cubic feet for the year, which is a record. A maximum dividend at the rate of 10 per cent. per annum was declared. The Manager and Secretary (Mr. S. E. Halliwell) reported that there was an increasing demand for the use of cookers and slot meters in the district. Increased storage was found necessary; and during the past year an additional lift was provided on the existing holder, which has raised the storage capacity from 230,000 to 380,000 cubic feet. The holder was brought into action in August, and was reported to be working satisfactorily. Benzol enrichment was also adopted with much success during the year.

First Year of United Work at Swindon.

At the recent annual meeting of the Swindon United Gas Company, the Chairman (Mr. W. H. Ludgate) gave the results of the first year's working of the amalgamated Companies. He said they had sold 122½ million cubic feet of gas, compared with 114¼ millions in the preceding year—being an increase of 8¼ millions. The value of the gas sold was £22,836, compared with £21,176 in 1901, or £1660 more. They had 5721 customers—an addition of 674—and 3885 of them used the penny-in-the-slot meters. The total receipts from all sources amounted to £32,225, against £29,313 in 1901, or an advance to the extent of £2912. The profits were £6383, against £4053—an increase of £2330. During the year the Directors had put up a new gasholder, and new retort-charging machinery had been installed. With regard to the price of gas, he had a scheme to bring before his colleagues on the Board to reduce the figure to 3s. 9d. per 1000 cubic feet to customers using gas for power purposes. The Directors' report was adopted, and dividends of 10, 5, and 4½ per cent. were declared on the different classes of stock.

The Bournemouth Company's Enlarged Sphere.

Under the provisions of the Act obtained by the Bournemouth Gas and Water Company last session, the works and business of the Town and County of Poole Gas and Coke Company were taken over on the 30th of September. The accounts presented at the recent half-yearly general meeting therefore contained the results of the working of the new station from that date. The total revenue was £60,287; the expenditure, £43,061—leaving £17,226 to be carried to the profit and loss account. The amount available for distribution was £20,365; and the Directors recommended the usual dividends at the rates of 6, 7, and 13 per cent. per annum on the preference, "B," and original shares respectively. This required £12,879, and left £7486 to be carried forward. The price of gas was reduced by 2d. per 1000 cubic feet at the beginning of last year; and a further reduction of a like amount is to be made from the 25th inst., when the figure will be 3s. in Bournemouth and 3s. 6d. in the Poole district. The Directors are promoting a Bill to enable them to improve and enlarge the works at the latter place; and in this they have received the cordial co-operation of the Local Authorities concerned.

Effect of Cheaper Coal at Harrogate.

At the recent meeting of the Harrogate Gas Company, the Chairman (Mr. S. Hornby), in moving the adoption of the report and accounts, which showed a balance of £9137 available for distribution, said the keynote of his remarks would be congratulation of the proprietors upon the result of the past year's working, the consumption of gas having been 6½ million cubic feet in excess of the year 1901, notwithstanding crippled consumption owing to weather and other conditions over which a Board of Directors had no control. Referring to the revenue, he explained that, although there was an increase in the quantity of gas consumed, the receipts from its sale were less than for the previous year. This was accounted for by the reduction of 2d. per 1000 cubic feet in the price, which took effect from Jan. 1, 1902. The revenue from coke had sustained a rather serious reduction; but this was happily counteracted by an improvement in the sales of tar and ammoniacal liquor. The expenditure had benefited by the reduced cost of coal; the outcome being a profit of £13,610 upon the year's working. This enabled the Directors to recommend the payment of the usual dividends; and these were accordingly declared, less income-tax.

Competition at Dover.

Notwithstanding the keen competition from the electric light to which the Dover Gas Company are now subjected, the consumption of gas still continues to increase. In fact, the extended use of prepayment meters in outlying districts has obliged the Company to lay larger mains in several directions, with most satisfactory results. At the half-yearly meeting last week, the Chairman (Mr. E. Wilsher Mannering) stated that the sales of gas in the six months exceeded those of the corresponding period of 1901 by 1,326,000 cubic feet, or 1·13 per cent.; while the receipts on revenue account showed an increase of £123. With regard to the proposed purchase of the electric light undertaking

by the Corporation, the Directors reported that this threatened the Company with a very serious state of affairs, both in a large increase of rates, and by unfair competition backed up by the public purse. They have, however, obtained an undertaking for the insertion of clauses in the Bill the Corporation are promoting which they believe will satisfactorily safeguard the interests of the shareholders in these respects. The full statutory dividend at the rate of 7½ per cent. per annum for the half year was declared, which will leave a sum of £623 to be carried forward.

A Gas Company's Electric Light Undertaking.

At the recent annual meeting of the Walker and Wallsend Union Gas Company, the Chairman (Mr. T. Crawford) stated that there had been a profit of £6546 on the gas portion of the undertaking, and a gross profit of £6306 from the supply of electricity. With regard to the latter, it would be seen from the accounts that the capital expenditure had increased to £134,542. The excess over the issue of shares was due to the contemplated transfer of the concern to the Newcastle Electric Supply Company, for which purpose a Bill was being promoted in Parliament. The Company had during the year generated 2,915,152 units, selling 2,413,318 units, against 1,156,779 and 908,674 units respectively for 1901. This was not up to the estimated expectation twelve months ago; hence the net profit, after meeting interest on loans, also the interest and depreciation to the Newcastle Electric Supply Company, was only £756 17s. 1d. The estimates given last year were based on 3,000,000 units sold at an average price of 1¼d. each. The present weekly output pointed to considerably over 3,000,000 units for the current year, and if maintained a good revenue account was assured. The report was adopted, and a dividend which, with the interim made 9¼ per cent. for the year, was declared.

Developing the "Slot" Business at Ferndale.

An example of what a small Company may do in the way of pushing business is furnished in the report presented at the meeting of the Ferndale Gas Company, Limited, a few days ago. There was an increase of 2,181,400 cubic feet in the quantity of gas sold last year to private consumers; those using slot meters numbering 552 at the close, compared with 284 having ordinary meters. The Directors had given considerable attention to the development of the sale of gas for cooking and heating purposes, and had entered into contracts with the Richmond Gas Stove and Meter Company, Limited, based upon a scheme propounded by the Secretary (Mr. Joseph Sprague), for fitting up dwelling-houses with slot installations, and the supply and maintenance of cookers, &c., for such dwellings, as well as those already fitted up by the Company, on conditions which were considered to be fair and reasonable, and to the mutual advantage of all parties concerned. Within a period of three months 111 dwellings had been fitted up, and 150 cookers fixed under the contracts. A large number of orders received awaited attention when the report was drafted, and further applications were regularly coming in. The profits realized allowed of the payment of a dividend of 10 per cent. upon the ordinary shares, and of $8\frac{4}{17}$ per cent. on the new shares, free of income-tax.

Improved Business at Brighton.

The accounts presented at the half-yearly general meeting of the Brighton and Hove Gas Company last Friday afforded evidence of the improved condition of the Company's business in the six months ending Dec. 31. Compared with the corresponding period of 1901, the sale of gas was greater by 1½ per cent., though the temperature during the latter part of the year was not favourable to an increased sale; and the sum realized from residuals was higher, owing to better prices and a more advantageous market. There was also a satisfactory reduction in the expenditure. Unfortunately, the half-year's history of the Company was marred by a dark chapter—viz., the action for damages brought against them by a consumer, who was successful in recovering £520, or about one-third of his claim. The revenue in the six months amounted to £109,654, and the expenditure to £79,001; so that £30,653 was carried to the profit and loss account. After paying the costs of the action already referred to and the interest charges, a balance of £28,579 was available for distribution. Dividends were declared for the half year at the following rates: 6 per cent. per annum on the "B," and 4 per cent. per annum on the "C" preference consolidated stock; and at the authorized rates on the ordinary capital—viz., 10¾ per cent. per annum on the original, and 7¾ per cent. per annum on the "A" ordinary consolidated stock. The payment of these dividends required £23,070, and left a balance of £5509 to the credit of profit and loss account to be carried forward.

Prosperity at Hastings.

In moving the adoption of the report for the past half year at the meeting of the Hastings and St. Leonard's Gas Company on Thursday, the Chairman (Dr. G. G. Gray, J.P.) had a pleasant task. He said that the first paragraph announced an increase of above 5¾ per cent. in the sale of gas, or over 12 million cubic feet. This was most satisfactory in itself, but also in its significance. The life of the Company had been one of continual progress. Each year had seen an increase in the sale of gas, the only apparent exception being the previous year; and even then they had a small increase. He put before them then some of the reasons for this diminution in the increase; and it was satisfactory to note that, concurrently with some of these causes being removed, they had made a return to the growth in sales they had had for so many years. The total receipts showed an increase of £2014; while on the expenditure side there was a small increase of £44. As a result, there was a profit of £11,383 on the half year, or an increase of nearly £2000. During the year, 330 public lamps had been converted from ordinary into the incandescent form. People in the neighbourhood of the new works at Glyne Gap would have seen that considerable progress had been made; and a general idea could now be obtained of their formation. As far as foresight could go, they had prepared for all requirements for some time to come. He hoped they would bear in mind that the ground had been paid for, and also the trunk line costing £23,000. In all, £52,000 had been expended, without raising a penny of fresh capital. They should also bear in mind that this capital was now unremunerative; and that the capital per 1000 cubic feet of gas was the same after the expenditure of all this money as it was when Mr. C. E. Botley, their Engineer and Manager, first came to the works. The cost had been well within the estimate; and they hoped in the summer of next year to start the first section of the works. The statutory dividends of 6½ per cent. on the converted 5 per cent. stock and 5 per cent. on the converted 3½ per cent. stock were declared.

A Flourishing Undertaking at Rushden.

The report presented at the twelfth annual meeting of the Rushden and Higham Ferrers Gas Company showed that continued progress characterized the working of the undertaking in the year ending the 31st of December. The quantity of gas made was 91,913,400 cubic feet, or 8,597,800 cubic feet more than in 1901, being an increase of upwards of 10 per cent. Though the price was reduced by 1d. at the beginning of the year, the revenue was £12,628, against £11,500. The augmentation in the business by means of prepayment meters was also very marked, the returns from this source during the year amounting to £3487, against £3026 in 1901. The total profits on the revenue account amounted to £3914, compared with £3052, owing largely to the more favourable terms on which coal contracts were arranged last summer. The Directors had paid a half-year's dividend at the rates of 10 and 7 per cent. per annum on the two classes of stock; and they recommended similar dividends for the remainder of the period covered by the accounts, as well as the addition of £300 to the reserve fund and £200 to the insurance fund. They had also felt justified in reducing the price of gas to ordinary consumers by 2d. per 1000 cubic feet, including all gas used by means of prepayment meters. In moving the adoption of the report, the Chairman (Mr. E. Claridge) congratulated the shareholders on the financial success achieved last year, and pointed out that by the reduction in the price of gas they were giving the consumers a share in the prosperity of the undertaking. He added that Mr. Watson (the Engineer and Manager) informed him that when he came to Rushden they were making only 37 million cubic feet of gas, and now they were producing 91 millions. This showed not only progress for the Company, but also in the population of the district. The report was adopted. In returning thanks for a vote in appreciation of his services and those of the staff, Mr. Watson said the progress of the undertaking would be better understood when he stated that the increase in the business during the past five years had been 245 per cent. Few companies could show such remarkable figures.

WATER.

Improved Working and Increased Rebate at Luton.

At the 70th half-yearly meeting of the Luton Water Company, the Chairman (Mr. B. Seebohm) made the gratifying statement that the undertaking was in a much stronger position and was better equipped than it had ever been. There was plenty of water for the engines to pump—in fact, the wells and the engines were equal to three times the average daily requirements of the town. He thought this was a very reassuring position both for the Company and the town. Another equally satisfactory point was that the Directors were in a position to allow a further diminution in the charges to water consumers; and the rebate of 7½ per cent. would be increased to 10 per cent. for the current half year. The report and accounts were adopted, and a dividend of 4 per cent. declared. Thanks were accorded to the Directors, officials, and Engineer (Mr. W. R. Phillips) for their services.

Providing Storage and Husbanding Resources in Newcastle.

The Act sanctioning the enlargement of the Catcleugh reservoir, and the carrying out of other works, by the Newcastle and Gateshead Water Company, was passed without any opposition; and in the report presented at the recent annual general meeting, the Directors informed the shareholders that the embankment had reached a height of 55 feet out of the total of 93 feet which it will rise above the bottom of the valley. Very satisfactory progress is being made with the Byker reservoirs, which are expected to be completed in the coming autumn. The carrying out of the measures for the prevention of waste, and the inspection, testing, and stamping of fittings at the new workshops of the Company, are already producing satisfactory results in economizing the consumption of water. This is highly necessary, for 1902 was an exceptionally dry year in Newcastle; the Company's gauges recording the smallest rainfall, with two exceptions, which has occurred over a period of 40 years. As a matter of fact, the reservoirs were not affected by any increase until December. Now, however, they are again nearly full. The accounts accompanying the report showed that the gross receipts last year were £166,914. After deducting working expenses, interest on debenture stock and loans, and the interim dividend paid in August last, there remained a balance of £55,521, which the Directors recommended to be appropriated as follows: To the payment of the dividend on the preference stock, £23,334; a dividend at the rate of 9 per cent. per annum for the half year on the ordinary stock, making 8½ per cent. for the year, £17,477; a dividend at the rate of £6 6s. per annum for the half year on the ordinary stock under the Act of 1876, making £5 19s. per cent. for the year, £10,080; and a dividend at the rate of £6 6s. per cent. per annum on the ordinary stock under the Act of 1898, from Oct. 31, 1902 (three months), £945—leaving £3685 to be carried forward.

Reduced Output of Gas at West Bromwich.—The sales of gas at West Bromwich for the Christmas quarter show a decrease of some 2 million cubic feet as compared with the corresponding period of the previous year. At the last meeting of the Town Council, the Chairman of the Gas Committee (Mr. Wilson) stated that nearly the whole of this reduction was due to the introduction of electricity. The Committee, however, have under consideration certain proposals by which it is hoped that the sale of gas may be largely augmented.

CAGLIARI GAS AND WATER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 3, Lothbury, E.C.—Sir JOHN AIRD, Bart., M.P., in the chair.

The SECRETARY (Mr. W. B. Peat) having read the notice calling the meeting,

The CHAIRMAN moved the adoption of the Directors' report and the accounts. He first expressed the regret of the Board, which he was sure would be endorsed by the shareholders, that Sir Frederick Wigan was unable to be present through illness; and he sincerely hoped that he would be quickly restored to the blessings of health. In regard to the Company's operations, he was glad to be able to present such a very satisfactory report and accounts as those before them, and at the same time to be able to assure the shareholders that the Company's relations with the City of Cagliari (which is the capital of Sardinia) were in every respect as good as they could wish them to be. He thought he could say on behalf of the authorities of Cagliari that they fully recognized and appreciated the efforts the Company had made in doing everything possible during the past year to ensure a regular and sufficient supply of water; and they would wish, he felt equally sure, to thank the Company for their attention to the gas industry, which had done so much to promote the comfort and prosperity of the people. Regarding the progress of the Company during the year (which was the thirty-seventh since the Company was formed), it had been exceedingly satisfactory. The receipts had increased by about £776; and the expenditure had decreased by about £714—making a total of £1490 to the good for the year. This had been due no doubt to the many circumstances that had been kind to them. First of all, they had had a better exchange; they had had to pay a lower price for coal; and they had made great progress during the year in the increase of gas lighting. They had, as he thought the shareholders were aware, made practically no profit on the public lighting, which had been increased but very little. On the other hand, however, the private consumers had advanced considerably; and through the use of incandescent gas-burners, the Company had made the supply of gas at Cagliari much more popular. They had also had, during the year, the benefit in the manufacture of gas of the regenerator furnaces, which his colleague, Mr. Simmelkjor, in his report, referred to in the following words: "In my last year's report, I promised you a great saving in fuel as soon as the new regenerator furnaces got to work; and these figures prove I was right. Hitherto our fuel account has been 4 tons to 4 tons 5 cwt. of coal carbonized by 1 ton of fuel; while, during 1902, with four regenerator furnaces going, we carbonized 6½ tons of coal with the same amount of fuel, so this means a saving of £380 in fuel." This was one of the satisfactory features connected with the Company, that they were always open to receive suggestions that would benefit the works by lessening the cost and giving a better supply to the city, for which they were bound to do their best. The regenerator furnaces had been one of the means adopted; and the Directors were very glad to see they had turned out so successfully. The electric lighting had not increased much. This was probably due to the excellent way in which the gas industry had been attended to and encouraged. Before he left the gas undertaking, he thought he ought to remind the shareholders that the concession of this particular part of their work would lapse in 1908; but, at the same time, he should also tell them that, if the Municipality decided to take over the works, they would have to pay us the full value; and if they do not choose to do so, we shall go on as hitherto, only we should have no monopoly, so that the Company were secured in every way. Although they might soon have to part with the gas undertaking, if called upon to do so, the Directors would be able to feel that they had properly protected the interests of the shareholders, who would not be any the worse off if the arrangement was carried through. However, the Board hoped that the satisfactory way in which the supply had been conducted through the period of the concession would enable the Directors to make some further arrangements with the authorities which would be mutually satisfactory and beneficial. Respecting the water supply, it was pleasant for him to be able to assure the shareholders that the works were in a most satisfactory condition. The reservoir during the year had been thoroughly cleaned, as well as the smaller reservoirs in Cagliari. Some alterations had also been made to the trunk main on behalf of the Government; and the main was found to be in a most satisfactory condition, with very little incrustation. The filters had not been used much; the water having been very good. The small pumping machinery, too, that was put up for supplying the upper parts of the town, they had only had occasion to use for a short period. The arrangement still continued for fitting up houses, and charging a moderate rental. This had given considerable satisfaction, and had been a great help to the people of Cagliari, some of whom could not afford the outlay, or might be changing their houses from time to time, and did not choose to incur the expense. The total outlay on this branch of the business had been £4750; and the rental received amounted to £418. The leakage had been a little more this year; and this had rather disturbed Mr. Simmelkjor. But the explanation was quite clear. The station meter had registered rather full; and this accounted for 1½ per cent., which represented the excess in the present year. The working of the gas undertaking had been exceedingly satisfactory; and it was with great pleasure that the Directors at their last meeting, and on behalf of themselves and the shareholders, presented Mr. Webster, their excellent Gas Engineer and Manager, with a gold watch, which was greatly appreciated, and which was offered to him with much satisfaction to the Board. With reference to the little lawsuits, which were, he said, part of the play in Sardinia and Italy, but about which there was nothing to cause any apprehension, as they were usually settled in an amicable manner, the Chairman drew attention to the fact that the Directors had reproduced in the accounts this year a sum of £350, which they held by them to pay a claim which might possibly be rendered by the Municipal authorities; and so the amount was available in case of need. In conclusion, he assured the shareholders that the Directors had been anxious during the year to keep the interests of the Company well forward; and they did feel, at the end of the year's working, they had been successful. Although they had the extra amount of £1490 available, the Directors thought it better on this occasion not to pay a larger dividend, but to keep it in reserve in case of any contingency arising.

Mr. F. W. BLUNT seconded the motion, which was carried unanimously.

Proposed by the CHAIRMAN, and seconded by Mr. S. SIMMELKJOR, a dividend at the rate of 8 per cent. per annum was declared for the past half year (making 7 per cent. for the year), together with a bonus of 2s. 6d. per share, all free of income-tax.

On the motion of Mr. W. R. GALBRAITH, seconded by Mr. A. G. BURNEY, the retiring Directors (Sir John Aird, Bart., M.P., and Mr. F. W. Blunt) were unanimously returned to their seats.

The CHAIRMAN said he was sorry to say a little difficulty had been caused by the much regretted death of Mr. H. Bishop, who, 34 years ago, became one of their Auditors. The sad event occurred about a month since; and the Directors asked the firm of which Mr. Bishop was a partner (Messrs. Turquand, Youngs, Bishop, and Co.) to audit the accounts in conjunction with the other Auditor (Mr. R. S. Robb). The time had come for Mr. Robb to be re-elected; and the Board suggested that Messrs. Turquand, Youngs, and Co. should be elected as Mr. Robb's colleagues.

On the motion of Mr. ROBERT PAYNE, seconded by Mr. PEAT, a resolution was passed in accordance with this suggestion.

The usual complimentary vote to the Chairman and Directors, proposed by Mr. PAYNE, terminated the proceedings.

HARROW AND STANMORE GAS COMPANY.

Further Application to Parliament—The Late Mr. James Glaisher.

The Ordinary Half-Yearly Meeting of this Company was held yesterday week, at the Albion Tavern, Aldersgate Street, E.C.—Mr. CHARLES HORSLEY, J.P., in the chair.

The SECRETARY and ENGINEER (Mr. James L. Chapman) having read the notice convening the meeting,

The CHAIRMAN moved the adoption of the report and accounts. He first read the former, which stated that, the increase of the Company's business necessitating an extension of the gas-works, a Bill had been deposited in Parliament for the acquisition of the necessary land, the extension of the works, and an increase of the Company's capital. The balance of profit and loss account was £4399; and the Directors recommended dividends for the half year at the rates of 8 per cent. per annum on the original "A" capital, of 7 per cent. on the additional "B" capital, of £5 12s. per cent. per annum on the additional "C" capital, and of 6 per cent. on the guaranteed shares, all less income-tax. Proceeding, the Chairman said he considered they had done exceedingly well during the half year. The gas-rental amounted to £9593, which was an increase of £711 over the corresponding period of 1901. The sale of gas in the half year in the Harrow district showed an increase of 10 per cent., in the Sudbury and Harrow Weald district of 10 per cent., in Stanmore of 2·55 per cent., and in the public lighting of 2·47 per cent.—making a total increase over the whole district of 7·64 per cent. This was very good indeed. The total receipts for the half year amounted to £11,640, which was an increase over the second half of 1901 of £940. The expenditure for the half year amounted to £8211, which was an increase of £618. The amount spent on coal, however, had been less by £158, and on oil by £187. On the other hand, repairs to works were £318 more, and stove and meter repairs £127 more. Rates and taxes had also advanced by £84; and under this head he was afraid they would have to pay a good deal more by-and-bye. The profit for the half year was £3429, which was an increase of £321. The total quantity of coal and oil gas made was 49,592,000 cubic feet. The amount of gas made per ton of coal was 10,294 cubic feet; and the oil used per 1000 cubic feet of oil gas was 3·15 gallons. The leakage on the half year was 9·13 per cent.; but, taking it over the whole year, it was 7·29 per cent. Since the shareholders met a year ago, the gas-works had been almost entirely rebuilt. They had a new retort-house now, with settings embodying the latest improvements—in fact, the whole works had been remodelled, excepting the gasholders. During the progress of all this work, the district had not once been short of gas; and this spoke well for their Engineer, who had had a great deal of anxiety during the past winter. He (the Chairman) could congratulate the shareholders on now being in possession of good works, in which they would be able to make gas in the cheapest way. They would save a good deal of coke by their new settings, and would, he believed, increase the make per ton of coal carbonized. He was well satisfied with what had been done in the twelve months; but still they wanted room for extensions in future. This being so, they had, as the shareholders were aware, a Bill in Parliament to empower them to purchase land, and to do other things. They also required further capital powers, seeing that all their authorized capital had been issued. As the Bill was a matter that would come before the shareholders again, he did not think he need at this stage say more on the point. There was only one other matter for him to mention. The shareholders would remember that for some time their old friend and colleague, Mr. James Glaisher, was very ill, and only recently had died. With Dr. Glaisher (who was a member of the Board), they all very deeply sympathized; and he (the Chairman) was sure that the shareholders would give expression to that sympathy.

The VICE-CHAIRMAN (Mr. A. H. Baynes) seconded the motion.

Mr. HILL made inquiries respecting the development of the prepayment system, and also stated that he was sorry the Directors were contemplating the issue of more capital, because, in his opinion, the capital stood much higher than it ought to do.

The CHAIRMAN and Mr. CHAPMAN, in reply, gave the information

that the Company had 720 prepayment meters fixed, and were still progressing. They gave 17 feet of gas for a penny. During the past half year, about £100 had been written off these meters; and as their cost was now entered at £1000, this represented about 10 per cent.

The motion was unanimously agreed to.

The dividends referred to in the Chairman's speech having been declared,

Mr. BAYNES proposed the re-election of the retiring Directors (Mr. C. Horsley and Dr. J. W. Lee Glaisher, F.R.S.). In doing this, he mentioned that Mr. Horsley had been connected with the Company from its initiation, and had rendered it yeoman service. Standing there, he (Mr. Baynes) could not but help remembering the honoured form of Dr. Glaisher's father, who took such a profound interest in the Company, and who, by his presence, gave prestige and importance to it. No man could have served any Company more faithfully and persistently than Mr. Glaisher. He had left an honoured name; and they rejoiced to know that he had a son who would bear it down to posterity.

Mr. A. F. PHILLIPS seconded the motion, which was carried.

The CHAIRMAN having responded,

Dr. GLAISHER acknowledged his re-election, adding that he could really feel that all Mr. Baynes had said about the interest his father took in the Company was true. He was the first Chairman, and filled that position for very many years. There was no Company, in his conscientious discharge of duty, in which he took more interest than the Harrow Gas Company. He was always extremely interested in the work and progress of the concern. For many years the progress was slow; and it seemed as if Harrow would not move along very fast. But his father lived long enough to see a change take place, and to see the Company go forward by leaps and bounds. When the Company went to Parliament last time, his father little thought that the Directors would have to agree to go to Parliament again in his lifetime. He was glad his father lived long enough to see such progress, and to see the Company emerge so well from the state of inanition in which it remained for many years. Although he (Dr. Glaisher) had not been a Director very long, he had, through his father, a personal interest in the Company from its inception, and from its early days when he attended as a shareholder; and he hoped, as far as he could, he should do his best for the Company in the way that his father would have wished.

On the proposition of Mr. W. CHURCH, seconded by Mr. POWELL, Mr. James Randall, the retiring Auditor, was re-appointed.

Mr. RANDALL, in responding, said he should like to say that, if Mr. Hill would buy the gas undertakings returns, and would compare the Harrow Company with others, he would be interested in finding that, taking the extent of the district and the sparse population they had to supply in some places, the Company compared very favourably in the capital per million cubic feet, per ton of coal carbonized, or per 1000 cubic feet. He (Mr. Randall) was unfortunately connected with one Company whose capital was equal to £2500 per million cubic feet; and if Mr. Hill would take Pinner and other places near Harrow, he would find it compared well with them. Gas companies had their obligations as well as their privileges; and one of their obligations was that they had to lay mains in sparsely populated districts, and get very little private consumption there.

A Special Meeting was then held for the purpose of approving of the Bill which has been introduced into Parliament.

The SOLICITOR (Mr. Bannister) said the objects of the Bill submitted for the approval of the shareholders were to authorize the Company to acquire lands, to construct gas-works, to raise additional capital, and for other purposes. Authority was required to extend the works to a piece of ground the Company purchased two or three years ago; and to acquire an adjoining piece of ground, in order that, when the growing business of the Company required, there might be a further extension on that land, which it was necessary the Company should have. The next object was to obtain authority to increase the "C" capital of the Company to the extent of £100,000, with the usual borrowing powers of one-quarter of the capital from time to time paid up. Briefly, this was the whole purpose of the Bill, which was a very simple one. There were certain ancillary provisions, such as to enable the Company to carry mains in streets where houses were built, but which had not been dedicated to the public.

On the motion of the CHAIRMAN, seconded by Mr. BAYNES, a resolution was passed approving of the Bill.

Proposed by the CHAIRMAN, and seconded by Mr. PHILLIPS, a hearty vote of thanks was passed to Mr. Chapman for his services; and subsequently, on the proposition of Mr. HORACE J. RYDON, J.P., seconded by Mr. RANDALL, a similar compliment was paid to the Chairman and Directors.

In responding, Mr. CHAPMAN remarked that, when it was remembered the Company had 60 miles of mains and only 2500 consumers, it would be seen that it took a large amount of capital to carry on the work. However, he believed they had turned the corner, and that they would now get more consumers on the present mains.

A brief acknowledgment by the Chairman concluded the proceedings.

Municipal Water-Works and Income-Tax.—When the payment of some claims was being considered last Wednesday by the Colchester Town Council, Mr. Sansom took exception to the item of £424 for income-tax on the water undertaking for the year 1901-2. He remarked that if the charges for water were reduced, the ratepayers, instead of the Government, would have the benefit of this sum. The Water Department seemed to be making a profit of over £6000 per annum. Alderman Wicks said the Water Committee were in favour of relieving the consumers at the earliest possible moment. The Superintendent of the Water-Works (Mr. C. E. Bland) stated that the profit was not £6000, but £2000 per annum; and after certain deductions had been made, the amount payable for income-tax would be £100 only.

GAS, WATER, AND GENERAL INVESTMENT TRUST.

The report presented at the Annual Meeting last Tuesday of the Gas, Water, and General Investment Trust stated that the revenue for the year ending Jan 28, after making provision for interest on debenture stock and all expenses, amounted to £15,781, to which had to be added the balance of £19,878 brought forward from the last accounts—giving a total of £35,659. Interim dividends were paid in respect of the first half of the year at the rates of 4½ per cent. per annum on the preferred stock and 3 per cent. per annum on the deferred stock, amounting to £10,252. The Directors recommended the appropriation of a further sum of £12,337 to the payments of dividends for the second half of the year at the rates of 4½ per cent. per annum on the preferred stock and 5 per cent. per annum on the deferred stock—making for the year 4½ and 4 per cent. respectively, and leaving a balance of £13,069 to be carried to the next accounts. It was remarked that the Trust still had a considerable holding of revenue securities for which no credit had been taken in the accounts. The amount of these had been increased during the past year; and the proceeds, when realized, would be available for revenue. The loss on sales made during the year had, after deduction of the profits realized been debited to suspense account. The Directors stated that there had been a material improvement in the amount of securities producing revenue, though some were still in default, and remained depreciated in value. The reports received from Salt Lake City continued to show a very satisfactory increase in the receipts of the Utah Light and Power Company; and the Board, therefore, looked forward with confidence to a gradually increased income from the shares in this Company.

In moving the adoption of the report and accounts, the Chairman (Mr. J. B. Braithwaite) remarked that there had been no change in the capital during the past year; while loans had been reduced from £120,455 to £109,870. The intention was to get this item down to £100,000, which would represent one-tenth of the capital, and which did not seem an unreasonable sum to borrow for re investment at a higher rate when times were good. The reserve for the equalization of dividends remained the same as in the previous year. On the credit-side of the balance-sheet investments showed a decrease of about £12,000. This item naturally corresponded more or less with the reduction in the amount of the loans. The gross revenue had fallen from £45,952 to £39,181. This reduction was due to the falling off in the profits they had in previous years been accustomed to make on underwriting and financial business generally. Such business was rather an important source of income to them; and it was of necessity of a fluctuating character. The past year had been a very quiet one; and therefore the Trust had not had an opportunity of making the profits they sometimes made in this respect. From this they would see the advisability of doing as they did in the previous year—namely, carrying forward a considerable sum and placing a substantial amount to a dividend equalization account, so that the deferred stockholders might feel that their dividend of 4 per cent. was secured to them for the next three or four years. The income derived in the past year from actual securities was very much the same as in the previous year; but practically the deferred stock was unrepresented by assets, and so the dividend on it must come from something other than the interest on the investments. So far the present year had opened rather more promisingly as regarded general financial business; and the indications were that the Trust would do better in this respect than in the past twelve months. With regard to the Utah Light and Power Company, in which they were largely interested, the very satisfactory progress which this undertaking had recently been making still continued. Last year, at the date of the meeting of the Trust, for the eleven months of the financial year of the Company which had then expired, there was a large surplus shown after covering bonded interest and all expenses; and this year the surplus was still larger. Last year the Trust received 1 per cent. on their large holding of preferred stock; and this year he believed they would receive the same. The Company were doing extremely well; and their revenue was increasing. The other concern in which the Trust were very largely interested—the United Railway and Trading Company—was also in a very satisfactory position. He (the Chairman) had recently visited both these properties; and he was more than pleased with all he saw.

The report was adopted, the dividends recommended were declared, and the retiring Directors (Messrs. J. Boustead and J. A. Kelman) and the Auditors (Messrs. G. Cloutte and P. D. Griffiths) were re-appointed.

Opposition to the Sutton Water Bill.—The Sutton (Surrey) Urban District Council have decided to oppose the Bill of the Sutton Water Company, who are asking for powers to obtain an additional supply of water from a source in the Chipstead Valley. The main object which the Council have in view is, it appears, to increase the purity of the supply, by compelling the Company to adopt a scheme of filtration.

High-Power Lighting in Western Australia.—Gratifying progress is being made with high-power gas lighting in Western Australia. At Perth, the Gas Engineer (Mr. William G. Quicke) has met with considerable success in the introduction of "Lucas" lamps, which enable him to supply a light of 700-candle power at 2d. per hour, against 6d. for an electric arc. During December, he displaced 28 32-candle power electric lamps at a large mercer's, by two interior and one exterior "Lucas" lamps, which are now a great attraction on Saturday nights. Many other firms have followed suit; and altogether gas lighting is "looking up." The cost of the 28 electric lamps referred to was 2s. 4d. per hour; while the charge for the three "Lucas" lamps which have taken their place is 6d. per hour. At the Charles Street Wesleyan Church, 60 gas-burners have been taken out to make way for two "Lucas" lamps, which has reduced the lighting bill from £4 to about 18s. a month, besides furnishing 300 per cent. more light. The success attending this installation, resulted in another order being given for the lighting of a large hall.

NOTTINGHAM CORPORATION GAS UNDERTAKING.

Discussion on the Reports by Sir George Livesey and Mr. Brown.

At the Meeting of the Nottingham Corporation on Monday, the 2nd inst.—the MAYOR (Mr. A. W. Black) presiding—the report of the Gas Committee, together with the reports of Sir George Livesey and the Gas Engineer to the Corporation (Mr. J. H. Brown), given in the "JOURNAL" last week, was presented.

Mr. C. B. TRUMAN moved that the report of the Committee be received and adopted. He said that after the criticism of Alderman Radford some time ago, the Committee were anxious that there should be a thorough investigation with regard to the gas undertaking. With this object in view, they had asked Sir George Livesey to inspect the whole of the works and report to the Committee; and, as the result, they now had a very elaborate and exhaustive report presented to them. Sir George had made many suggestions and recommendations, some of which had been anticipated by their Engineer, while others were receiving the attention of the Committee, and would be adopted by them. The two most important points referred to in the report were those in relation to the illuminating power of the gas and the purchase of the coal. Both Sir George Livesey and Mr. Brown recommended a reduction in the candle power of gas. The other point was with regard to the supply of coal, and to the fact that the Council distributed their favours too far away. They would shortly bring their annual report before the Council, and then he believed the results would be fairly good. He thought the undertaking was not in so serious a condition as Alderman Radford and others would make out. At all events, they had in Mr. Brown an engineer of great ability, as was evidenced by the report brought before the Council; and the Committee would, he believed, be able to show results equal to those of any corporation gas undertaking.

Alderman WOODWARD seconded the motion. He said that there was one matter to which he wished to refer, and that was the recommendation by Sir George Livesey of the use of a number of short chimneys instead of one long one. He did not think the Committee would be guided in this matter by Sir George's advice, as it would, to his mind, be a very serious mistake. Another thing to which he would call attention was the recommendation to buy coal more largely locally. He had been a member of the Gas Committee for a great many years, and would explain the practice followed by them. They had a very excellent testing plant at the works—their new Engineer said he had never seen anything so good, and did not know of anything better. The coal was tested throughout the year, and at the time of buying the coal reports were presented as to the quantity of gas produced, the illuminating power, the quality of the coke, and the price it fetched in the market. In the making of gas they had very good results; but the residuals were not worth anything. In one case they had to take back the whole of the residuals in exchange for the coal. There was a certain kind of coal which they got from Yorkshire which they could not possibly obtain from Derbyshire or Nottinghamshire. For the coke made from the Yorkshire coal they could get 17s. 10d. per ton; but they could not get anything like this price for what was produced from the coal supplied from the local collieries. The Committee were endeavouring to supply at a reasonable price the very best gas that could be made for a reasonable price.

Alderman FRASER said he thought no good would result from endeavouring to discuss the small details of the management and the working of the undertaking. He should like to say that he thought the Vice-Chairman (Mr. Truman) had made rather a mistake in appearing to resent the criticisms which were passed on the undertaking by his friend Alderman Radford. For some reason or another the Gas Committee appeared to be very sensitive, however gentle the criticism might be. He thought Alderman Radford performed a public service when he called attention to the state of the gas undertaking, and he (the speaker) felt that the bulk of the Council would agree that the report of the expert who was called in amply justified his friend in all he had said. He (Alderman Fraser) hoped the Council would remember the report, and would also bear in mind that, though expressed with studied moderation, it was, in fact, a condemnation of the working of the Gas Department in the past; and he thought the Council would require from the Committee not merely a rendering of a statement of accounts, but that they should embody in their annual report some record of what they had done to carry out the recommendations of Sir George Livesey. There were two points arising out of Sir George's report which were matters of great gravity. The first was the suggestion that the Engineer of the gas undertaking should be separated from the commercial management of it. Now he (Alderman Fraser) did not hesitate to say that it was the universal opinion of commercial men that the professional, scientific engineer should be separated from the commercial working of the department. He was quite certain that their new Engineer, in whom the Vice-Chairman of the Committee seemed to have a profound belief, would have, if he was to do his duty, to give the whole of his time and attention to the engineering part of the work; and he (Alderman Fraser) sincerely hoped the Committee would take this matter into serious consideration as soon as they could. The other point to which he desired to call attention was contained in the postscript to Sir George Livesey's report in which he suggested they should appoint a Consulting Engineer—someone with whom their Engineer could confer in time of difficulty, and upon questions of great importance. He (Alderman Fraser) entirely agreed with Sir George. They had in their Engineer, practically speaking, a young man; and as they would in the future probably be expending a large sum of money to bring the gas-works into the best possible working condition, he himself would feel better satisfied if the Engineer had a consultant to whom he could refer in matters of difficulty and great importance, rather than act upon his own responsibility. He doubted if it was fair to a young man, very able though he might

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 630.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	18½—19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	Nov. 13	6½	Bombay, Ltd. . . .	5¾—6¼	..	5 4 0
40,000	5	,,	6½	Do. New, £4 paid	4¼—4¾	..	5 9 5
380,000	Stk.	Feb. 26	12	Brentford Consolidated	242—247*	..	4 17 2
286,700	,,	,,	9	Do. New . . .	177—182*	..	4 18 11
50,000	,,	,,	5	Do. 5 p.c. Pref. .	133—138*	..	3 12 6
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb. .	110—113	..	3 10 10
220,000	Stk.	Sept. 11	10¾	Brighton & Hove Orig.	212—217	..	4 19 1
246,320	,,	,,	7¾	Do. A. Ord. Stk. .	155—160	..	4 16 11
460,000	20	Sept. 26	10	British.	39¾—40¾	..	4 18 9
50,000	10	Aug. 14	12	Bromley, Ord. 10 p.c. .	—	..	—
82,850	10	,,	9	Do. 7 p.c. . . .	—	..	—
500,000	10	Oct 15	7	Buenos Ayres (New) Ltd.	10½—11	..	6 7 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
150,000	20	July 11	8½	Cagliari, Ltd. . . .	23—25	..	6 12 0
100,000	10	Sept. 26	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
1,375,000	Stk.	Feb. 26	5	Commercial 4 p.c. Stk.	105—108*	..	4 12 7
503,750	,,	,,	4¾	Do. 3½ p.c. ,,	99—102*	..	4 13 2
407,812	,,	—	3	Do. 3 p.c. Deb.,,	90—91	..	3 4 6
800,000	Stk.	Dec. 11	8	Continental Union, Ltd.	115—125	..	6 8 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
575,000	Stk.	Feb. 26	5½	Crystal Palace Ord. 5 p.c.	112—117*	−2	4 11 1
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—125*	+2	4 0 0
106,158	,,	Jan. 15	5	Do. 5 p.c. Deb. Stk.	137—140	..	3 11 5
486,090	10	Jan. 29	10½	European, Ltd. . . .	18—19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Feb. 12	4⅛	Gas-light and Coke	4 p.c. Ord. . .	83—85	5 3 6
2,600,000	,,	,,	3½		3½ p.c. max. .	86—88	3 19 7
3,799,735	,,	,,	4		4 p.c. Con. Pref.	106—109	3 13 5
4,193,975	,,	Dec. 11	3		3 p.c. Con. Deb.	91—93	3 4 6
252,500	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.		90—95	5 5 3
70,000	10	Oct. 30	8	Hongkong & China, Ltd.		14¾—15¼	5 3 3
3,800,000	Stk.	Nov. 13	10	Imperial Continental .		204—207	4 16 7
473,600	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.		100—103	3 8 0
165,242	Stk.	Aug. 28	6	Lea Bridge Ord. 5 p.c.		115—120	5 0 0
561,000	Stk.	Feb. 26	16	Liverpool United A .		219—221†	4 10 6
718,100	,,	,,	7	Do. do. B .		161½—163¾*	4 5 8
306,083	,,	Dec. 31	4	Do. do. Deb. Stk.		114—116	3 9 0
75,000	5	Dec. 11	5	Malta & Medn., Ltd. .		4⅜—5	5 0 0
360,000	100	Oct. 1	5	Met. of	5 p.c. Deb.	105—109	4 11 9
850,000	100	,,	4½	Melbourne	4½ p.c. Deb.	103—105	4 5 9
541,920	20	Nov. 13	3½	Monte Video, Ltd. . .		9¾—10¼	6 13 4
1,515,892	Stk.	Feb. 20	4½	Newc'tle & G'tesh d Con.		102½—103½	4 7 0
346,855	Stk.	Jan. 2	3½	Do. 3½ p.c. Deb.		97—98	3 11 5
300,000	Stk.	Nov. 27	8	Oriental, Ltd. . . .		143—148	5 8 1
600,000	5	Sept. 26	7	Ottoman, Ltd. . . .		6—7	5 0 0

* Ex. div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
105,005	Stk.	Jan. 15	6⅝	Ply'mth & St'house 5 p.c	127—132	..	4 12 9
851,070	10	Oct. 15	7	River Plate Ord. . .	10¾—11¼	+¼	6 4 5
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb..	93—95	..	4 4 3
250,000	10	Sept. 26	8	San Paulo, Ltd.. . .	11⅛—12⅜	..	6 8 0
135,000	Stk.	Sept. 11	10	Sheffield A	238—240	..	4 3 4
209,984	,,	,,	10	Do. B	238—240	..	4 3 4
523,498	,,	,,	10	Do. C	238—240	..	4 3 4
103,235	Stk.	Sept. 26	5	Shrewsbury Ord. 5 p.c.	113—116	..	4 6 2
6,000,000	Stk.	Feb. 12	5⅛	South Met., 4 p.c. Ord.	120—122	..	4 7 4
1,780,000	,,	Jan. 15	3	Do. 3 p.c. Deb. . .	91—93	..	3 4 6
380,940	Stk.	Nov. 13	5	Southampton Ord. . .	103—1073	..	4 13 6
87,950	,,	Jan. 15	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
120,000	Stk.	Feb. 26	6	Tottenham and Edmonton	A. 5 p.c.	115—120*	5 0 0
300,520	,,	,,	4½		B. 3½ p.c.	93—96*	4 13 9
182,380	10	Dec. 30	5	Tuscar, Ltd.. . . .		8½—9¾	5 5 3
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.		94—96	5 4 2
730,872	Stk.	—	5†	West Ham, 5 p.c. Ord.		97—102	4 18 0
				WATER COMPANIES.			
780,668	Stk.	Dec. 30	11⅓	Chelsea, Ord. . .		315—325	3 10 9
150,000	,,	,,	5	Do. 5 p.c. Pref. .		150—155	3 4 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75		138—143	3 2 11
175,785	,,	Sept. 26	4½	Do. 4½ p.c. Deb. .		140—145	3 2 1
1,720,560	Stk.	Oct. 15	8	East London, Ord.. .		228—233	3 8 9
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb. .		142—147	3 1 3
1,282,943	,,	,,	3	Do. 3 p.c. Deb. .		97—99	3 0 7
700,000	50	Dec. 11	8	Grand Junction	10 p.c. max..	117—122	3 5 7
310,000	Stk.	Sept. 26	4		4 p.c. Deb..	125—130	3 1 7
708,000	Stk.	Feb. 26	10½	Kent		295—305*	3 8 10
160,000	,,	,,	7	Do. New, 7 p.c. max..		195—205*	3 8 4
1,043,800	100	Dec. 30	11	Lambeth, 10 p.c. max..		305—315	3 9 10
406,200	100	,,	8½	Do. 7½ p.c. max..		220—230	3 13 11
350,000	Stk.	Sept. 26	4	Do. 4 p.c. Deb..		125—130	3 1 7
500,000	100	Feb. 12	12 10/0	New River, New Shares		390—400	3 4 0
1,000,000	Stk.	Jan. 29	4	Do. 4 p.c. Deb..		125—130	3 1 7
902,300	Stk.	Dec. 11	7	South-wark and Vauxhall	Ord. . . .	203—208	3 7 4
126 500	100	,,	7		7½ p.c. max.	195—205	3 8 4
489,200	Stk.	,,	5		5 p.c. Pref.	151—154	3 4 11
1,019,585	,,	Oct. 15	4		4 p.c. A Deb.	125—130	3 1 7
1,155,066	Stk.	Dec. 11	10	West Middlesex. . .		290—300	3 6 8
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .		140—145	3 2 1
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb. .		97—99	3 0 7

* Ex. div.

† Next dividend will be at this rate.

be, to put upon his shoulders responsibility of that sort. As he got older he would acquire experience, which was usually dearly bought; and he (Alderman Fraser) should like the cost of that experience to be as little as possible. Therefore, in the early years of his office, he hoped Mr. Brown would be afforded by the Committee the opportunity of obtaining the best advice he could. It was perfectly obvious that the members of the Committee themselves could not be experts—they could only manage the commercial part of the business; and therefore, if the Engineer acted upon his own responsibility, he practically exercised it without sufficient control He himself thought the engineering and commercial part of the work should be entirely separated; and he was also strongly of opinion that no work involving great cost should be undertaken in the immediate future unless the Engineer was advised by somebody who had gained expert experience.

Mr. PENDLETON expressed his pleasure that the Committee had not repeated the error they committed when they stated some time ago that more wages were paid in Nottingham than in Sheffield. As a matter of fact, the Sheffield Gas Company paid slightly more, though the results in Nottingham appeared to be better. He desired to draw attention to the circumstance that a few men were working twelve hours a day or twelve hours a night. This was a scandalous shame, and he hoped the Committee would consider the position of these men.

Alderman Sir JOHN TURNEY regretted that the Chairman of the Gas Committee (Alderman Ford) and Alderman Radford, who initiated these inquiries, were not present. The introduction of these reports was dealt with in a most extraordinary way. It was a long time since they had had reports so important as those, and dealing with so gigantic a concern as the gas undertaking; and yet they were left practically by saying: "We have done as well as we could; we are going to try to do better." He fully endorsed what Alderman Fraser had stated. He was not satisfied with the last paragraph of the Gas Committee's report: "The whole of the reports, both of Sir George Livesey and Mr. J. H. Brown, are receiving the most careful attention of your Committee; and where they [Sir John emphasized the word 'they'] find it will be advantageous to give effect to such recommendations as have not yet been adopted, the same will be carried out without delay." This brought him to a paragraph in Sir George Livesey's report dealing with the Sheffield Gas Company. It seemed to him that the reason that Company had been such a great success was that their Chairman and the Directors thoroughly understood their job. Sir George Livesey's postscript had been referred to. Now, he would like to know, taking the postscript into consideration, what the Committee were going to do with the recommendations put before them. He was not finding fault with the Committee. There was no practical engineer upon it—no gas expert; and therefore he said the work ought not to be left entirely in the hands of the young man who was their recently-appointed Engineer. He had not the least doubt that Mr. Brown was a man of great ability, and had had practically all the experience a man could get who had lived the few years he had done. But when he had lived ten years longer, his experience would be worth more to them than it was to-day; and he (Sir John) asked the Council to recommend that the Gas Committee should retain Sir George Livesey as their Consulting Engineer, so that their Engineer would have the best man in England to refer to and help him in his difficult task. He (Sir John) had not the least doubt that a great amount of money would have to be spent in the reconstruction of the works. It was useless for the Engineer to talk about the sum now; in twelve months he would know a great deal more. They must not rush the thing—the work must be carefully and thoughtfully carried out; and unless it was carried out under the guidance of such a man as Sir George Livesey, an enormous amount of money might be laid out which would be no more productive than the money spent during the last ten years. Alderman Woodward had informed them that they had analyzed the coal. He (the speaker) thought they had been analyzing until they did not know what they were doing. Whether it was the fault of the coal or the way in which it had been dealt with he knew not; but the analysis had not helped the job in any way whatever. The result had been as bad as it could be. He hoped they would have more satisfactory reports from the Committee.

Mr. J. H. BROWN (a Councillor) thought it would be more satisfactory if the Gas Committee were prepared to accept the recommendations in the reports, especially those of Sir George Livesey.

Mr. TRUMAN replied that no doubt when the Committee brought up their annual report there would be further observations contained therein on the two reports just considered.

The motion was then carried.

USE OF GAS FOR POWER PURPOSES AT STOCKPORT.

Reduction to Regular Consumers.

The proposal of the Stockport Gas Committee to reduce the price of gas used for industrial purposes, was considered by the Town Council last Wednesday. The discounts suggested are based upon the maximum requirements for a working week of fifty hours, and ranged up to 10d. per 1000 cubic feet. Gas-engines are to be taken on a basis of 20 cubic feet per indicated horse power (with modifications to be agreed upon for engines above 10-horse power), gassing frames 1 cubic foot per jet, and hat manufacturers on actual tests of stoves and appliances used. The Mayor (Alderman William Lister) pointed out that by this scheme the Committee were not giving any concession whatever for lighting purposes. The constant consumer for industrial purposes would get the full advantage of the reduction which it was proposed to allow. For shorter hours than the maximum figure fixed, a *pro rata* reduction would be allowed. There were about 8000 small private consumers from whom the gas-works made no profit; it was from the large consumers for industrial purposes that the profit came. The Committee were aware that they were confronted by competition in the shape of

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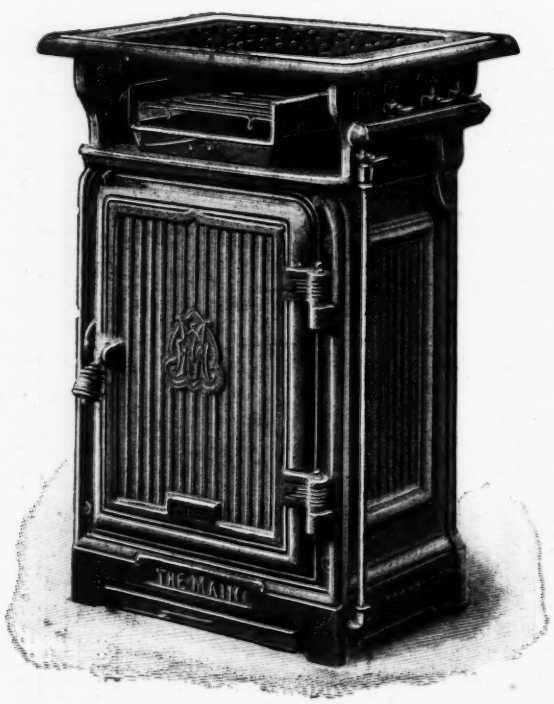

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a Bill to be introduced to Parliament which sought to supply gas throughout Cheshire for industrial purposes. They would have this Bill to oppose; and a good point in their opposition would be the scheme which they were now adopting for the encouragement of large consumers. Mr. Ball submitted that the stipulation for a working week of fifty hours, taking 52 weeks in the year, was more than the working hours of this country at the present time ought to be fixed at, either by municipal or any other bodies. He thought that a less time might be fixed in which the manufacturers could be enabled to claim full advantage of the reduction. Coming down to other manufacturers, he presumed that the data had been obtained from actual figures of consumption; but he did think the large consumers should be as far as possible placed on the same terms as the larger manufacturers, in order that they could place before them the advantages of using gas for industrial purposes. The consumption of gas was decreasing from the amount which was formerly used, owing, he supposed, to various causes. But still the decrease was very apparent; and whatever they could do in order to get good customers for their gas, apart from the opposition to the Bill referred to, they should do. But he hoped that when the scale of charges was finally made the basis for gas-engines would be on brake horse power and not on indicated horse power, which was a term not used in the mechanical world at the present time. Calculating on the figures of the Gas Engineer, there would not be a single consumer in Stockport who would become entitled to the full discount; and he thought the large consumer should enjoy it if he worked the full standard rate of hours. In fixing the hours, a proper basis would be fifty hours per week and 48 weeks per year. Mr. Sharples said it was clear to him that there was no manufacturer in Stockport who would ever obtain the maximum discount; and he might remind them that while in some neighbouring towns the usual price of gas was 1s. 11d. per 1000 cubic feet, this was only the price in Stockport under the special conditions now proposed. In other manufacturing towns there was a fixed price for gas to manufacturers. He would take Bury for example, where the price per 1000 cubic feet was 1s. 9d. for manufacturing purposes. Mr. Hewitt said it seemed to him that, if the proposed scale was insisted on, people who only used gas-engines three or four hours a day and four days a week would be entitled to no discount at all. Mr. Rowbotham pointed out that the great idea of the Committee was that the discount should go to the constant consumers; and he did not see what particular claim the other persons had. Mr. Webb said that, with regard to the question of hours referred to by Mr. Ball, the general shop hours were 54 or more per working week, so that really the Engineer had under-estimated the ordinary working hours in making up the proposed scale. The Mayor remarked that the Committee had a large plant which during the summer months was producing nothing, but was still very expensive. What therefore they wanted to do was to find the plant some work to do during the day-time. By the arrangement which was proposed, even the irregular consumer for manufacturing purposes might be entitled to some reduction. The proposal was then agreed to.

ALLOCATION OF GAS PROFITS AT BELFAST.

The Belfast Gas and Electric Committee having recommended the allocation in the coming year of £15,000 out of the gas profits as a contribution in aid of the general purposes rate, the matter was considered at a special meeting of the City Council on Monday of last week. Mr. Dempsey said the amount to be taken was the same as last year; but if there was a substantial profit on the manufacture of gas, he thought the consumers were entitled to share that profit. They had a right to a reduction in price. He contended that if the undertaking had been properly conducted, the price of gas should not now be more than 1s. 6d. per 1000 cubic feet. The Committee had reduced the capital expenditure out of the payments made by the gas consumers until it was something like £100,000 or £150,000. He thought the financial proposition was an error, inasmuch as it aimed at taking the whole of the profits of the gas-works for the relief of the ratepayers. Mr. Andrews said he would ask the Council to bear in mind that the gas profits would not stand those repeated drafts made upon them. There was already a standing charge on the account amounting to £11,000 money borrowed for the extension of the gas-works. There was a further charge lately saddled on the gas funds, which came to about £5000, for the interest on the amount of money already expended on the new City Hall; and it seemed to him that this was being constituted a permanent charge upon the gas fund. Whether that was a right, fair, and just apportionment, was a question for the Corporation at large. The sum of £15,000 had been voted from the surplus profit of the gas-works this year and last; and probably at the end of this year there would be a very small surplus profit. The question really before the Corporation was whether the sum could be voted out of the augmented surplus, or whether it must be earned in the year in which it was voted. From some figures he had obtained from the Accountant with regard to the matter, he believed the probability was that the profit on the gas-works for this year would be about £32,000. There was already allocated £21,856; and therefore the balance would be about £10,000. Of course, this would not pay another £15,000. Dr. M'Donnell held that there was no equity in the apportionment of the money recommended by the Committee. He thought gas should be cheaper and the quality improved. Alderman John M'Cormick entirely dissented from the proposition of Mr. Dempsey and Mr. Andrews. He was of opinion that the profits arising from the gas-works constituted a very suitable fund for relieving the rates. They all knew that the gas undertaking had been a successful one; but it must not be lost sight of that it was originated on the credit of the city. He thought it was a false proposition to say that the gas consumers were to receive the sole benefit. Suppose the venture had been an unsuccessful one, upon whom would the loss have fallen? It would have fallen upon the whole community; and, therefore, when it proved prosperous, and profit arose from its working, the ratepayers as a whole were entitled to receive the benefit. The recommendation was then agreed to.

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MORE ABOUT THE LEICESTER GAS.

The controversy which has lately been raging in the Leicester papers in regard to the quality of the gas supplied by the Corporation does not seem to abate as the result of the dissemination of information, by means of leaflets and pamphlets, by the Gas Engineer (Mr. Alfred Colson, M.Inst.C.E.). Among other severe critics were Messrs. A. Donisthorpe and Nephew, of Friar's Mills, who wrote in very strong terms about "the abominable illuminating power of our gas." The chief complaint was that, although sometimes a good and bright light was obtained, usually the light was nothing but "a thick, foggy, yellow and black flame," which was characterized as "a disgrace to all concerned in its manufacture." Messrs. Donisthorpe further declared that they had done everything the gas-works officials had suggested, on frequent visits, at a cost of about £60; but there still remained this "wretched gas." A representative of the "Midland Free Press" had a long interview with the Chairman of the Gas Committee (Mr. Edwards) in regard to the above complaint, and was informed that the cause rested entirely with those who made it. He said: "As the firm's business has increased, and the factory from time to time been enlarged, they have bit by bit added one gas-pipe here and another there, with the result that there is a falling-off of pressure between the outlets of the meters and the various parts of their extensive premises. They have been advised to take out the major part of their fittings and 'scrap' them, as, under the circumstances, they can never receive a satisfactory supply. To this they at present object." Curiously enough, the firm suddenly found their light greatly improved, and congratulated Mr. Colson upon the change he had effected. But, as a matter of fact, the improvement was due to causes over which neither he nor the Gas Committee had any control. He called upon them and pointed out that they were subject at any moment to a recurrence of the old state of things arising from any extra demand for gas either on their own premises or in the adjoining district, and that the only safeguard was to have the services and pipes throughout the mills of ample capacity, so as to avoid any fall in the pressure between the outlets of the meters and the burners. It is not a little singular that at the very time Mr. Colson was receiving congratulations at Messrs. Donisthorpe's mills with regard to their splendid lights, a letter was being written to one of the papers, in which the writer complained that in consequence of the poor light he was being compelled to knock off work!

By an announcement in another column, it will be seen that the Barking Gas Company are offering 1800 ordinary £10 shares for sale by tender. This is a portion of the additional capital recently authorized to be raised, and it is entitled to a maximum dividend of 7 per cent. The 28th inst. is the last day for receiving tenders.

SOUTHPORT CORPORATION GAS SUPPLY.

Mr. Corbet Woodall has presented to the Gas Committee of the Southport Corporation his report with reference to the manufacture and enrichment of gas. He says the heats obtained in the brick retorts are much too low, and that the coal is not thoroughly carbonized; but that those in the two benches of clay retorts, and the carbonization, are satisfactory. He recommends that the brick retorts should be abolished, and clay ones substituted; that the Gas Committee should consider the desirability of building a new retort-house, for which he will furnish an estimate free of charge; that they should in future supply gas of uniform quality, composed of 63 per cent. of coal gas, enriched by means of 37 per cent. of carburetted water gas; and that to meet the demand for gas in the lighting season of 1904, they should instal two additional units of water-gas plant in the present house, so as to permit of the use of three units, with one unit as a stand-by. The Engineer (Mr. John Booth) has reported that the average result of 12 testings of the gas was 16·72 candles; and he has been instructed to carry out the recommendations of Mr. Woodall in regard to supplying a uniform quality of gas. It has been further resolved to give notice of the composition of the Southport gas to the makers of gas-engines, gas-stoves, and incandescent burners; to alter all stoves, engines, &c., so as to render them suitable for use with the gas which will be supplied in future; and to make the necessary increase in the day and evening pressure. The sale of cooking-stoves by the Gas Department is to be discontinued.

PUBLIC LIGHTING OF SOUTHWARK.

A Financial Question.

At the Meeting of the Southwark Borough Council last Wednesday, the Finance Committee reported having had under consideration a paragraph in the District Auditor's report, calling attention to the fact that payments for expenditure incurred during a financial year cannot lawfully be spread over subsequent years, unless sanction to borrow has been obtained. The point raised was in reference to a contract entered into with the South Metropolitan Gas Company by the Vestry of St. George-the-Martyr in July, 1900. The Company altered 560 lamps to the incandescent system (150 being provided with new columns); and the Vestry undertook to pay £1000 for the conversion in twenty quarterly instalments. Of this amount, instalments equal to £500 had been paid. The Town Clerk (Mr. J. A. Johnson) said he had given careful consideration to the present validity of the contract. Having regard to the fact that it was made by the late Vestry, and had been transferred by the London (Adaptation of Enactments) Order, 1900, to the Council, and as the object of the contract

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was strictly within the Council's work, he did not think it was void by reason only of sanction not having been obtained to the borrowing of the amount referred to. The Conveyancing Solicitor of the London County Council had informed him that in one or two other instances, where the Auditor had raised similar objections, the Council had sanctioned payment of the remaining instalments as in the nature of money borrowed. It was resolved, in order to overcome the difficulty raised, that application should be made to the Council for sanction to the borrowing of £500 in connection with the contract, to be paid off in ten instalments of £50 each.

PUBLIC AND PRIVATE LIGHTING IN SPAIN.

The Direccion General de Contribuciones has published statistics for the year 1901 relating to the lighting industries of Spain; the two most important parts dealing with the manufacture of gas and the generation of electricity. The number of cubic metres of coal gas annually manufactured by the 79 works in Spain for the year named was 136,853,231, or about 4831 million cubic feet. These principal works are located as follows: Barcelona, 20; Cadiz, 7; Tarragona, 7; Baleares, 6; Gerona, 6; Valencia, 3; Murcia, 3; Valladolid, 3; and Alicante, 8. The following are the places where the largest quantities of gas are annually made (the figures being cubic metres): Barcelona, 46,022,485; Baleares, 34,821,000; Madrid, 11,436,545; Cadiz, 7,738,000; Valencia, 7,425,195; Seville, 5,811,895; Huelva, 5,256,000; Tarragona, 2,248,612; and Malaga, 2,207,417. The great difference between Madrid and Barcelona is due to the high prices in the former capital; and the proof is the large comparative consumption by a much smaller population in the province of Cadiz. The number of electric light works is considerable, no doubt on account of the expensiveness of petroleum, due to Customs tariffs. But dear as electricity is in most parts of Spain, it is really cheap compared with petroleum, considering its convenience. People are surprised at the progress of electricity in Spain; but what is astonishing is that 30,000 tons of petroleum are still imported. There are electric light works in all the provinces; the total being 961, having 1384 dynamos, with a capacity of 42,248,856 kilowatt-hours. The provinces possessing the greatest number of works are the following, the number of dynamos being given in parentheses: Barcelona, 266 (299); Gerona, 64 (71); Saragossa, 41 (49); Oviedo, 37 (51); Valencia, 35 (50); Alicante, 33 (40); Madrid, 30 (109); Seville, 28 (35); Badajoz, 20 (27); and Valladolid, 20 (24). It will be seen from the following figures, showing the production of electricity in kilowatt-hours, that while Barcelona is the largest consumer of gas, Madrid stands in the first place in regard to electricity: Madrid, 12,424,668; Barcelona, 4,592,886; Saragossa, 1,793,096; Salamanca, 1,400,518; Valencia, 1,388,506; Gerona, 1,129,717; Valladolid, 1,106,411; Alicante, 1,074,830; Seville, 1,057,992; Granada, 1,044,212; Malaga, 1,024,920; Badajoz, 893,774; and Cadiz, 931,683.

ELECTRIC LIGHTING NOTES.

The Electric Light Squabble at Taunton.

Bearing upon the recent controversy at Taunton over electric light affairs, and the lively scenes at the Town Council meetings in connection therewith, to which reference was made in the "JOURNAL" last week (p. 575), the latest development, writes a local reporter, is that six members of the Electric Light Committee, including the Chairman, have resigned their positions on the Committee, and the matter will come on for consideration at the meeting of the Council to-day.

Bath's Electric Lighting Burden.

The Committee appointed to advise the Bath City Council what to do with the offer made by the Bath Electric Tramways Company to acquire the electric lighting works on a lease for 32 years, have decided to recommend that the offer be not accepted. It may be remembered that it was to pay to the Corporation, as rental, sufficient every year to meet the interest and sinking fund on the present capital —£110,000; and the Company said they would also pay the Corporation, by instalments spread over the period of the lease, the sum of £5100, which represents the actual cost of the undertaking to the rates. These two sums together represent an annual rental of £6660; but as the Corporation can already rely on a gross profit of this amount, the offer was not attractive. The decision not to part with the works commits the Corporation to a further large capital outlay—probably to the extent of £50,000.

Coventry Water Supply.—Mr. E. Pearse Burd held an inquiry at St. Mary's Hall, Coventry, a short time since, on behalf of the Local Government Board, into the Coventry Corporation's application for a Provisional Order to amend the Coventry Water Act, 1889, so as to allow of the borrowing of further sums for the general purposes of their undertaking, and to enable them to complete the purchase of so much of the North Warwickshire Water Company's undertaking as they are obliged to by the Order. It was explained that the cost of the portion of the works which the Corporation were acquiring had been fixed by the Arbitrator at £39,209; and the total amount required, inclusive of costs, was £41,000. In addition, the Water Engineer estimated that £1500 would be required to make the requisite connections. By the suggestion of the Local Government Board, there was also included power to borrow such further sums as would be needed for the general purposes of the water undertaking, which had been placed for the next five years at £6000. Against this sum of £48,500, the balance of the borrowing powers of the department was £33,900, and the application was to enable them to exercise further powers to the extent of £14,000. The transfer of the portion of the Company's undertaking acquired by the Corporation had to be completed by the 23rd of June. There was no opposition to the application.

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SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT, MON. (Second Contract)	250,000
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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A new and deplorable element is developing in public life, in the shape of ratepayers' associations and other outside bodies, whose object is to control the actions of the public representatives who are vested with statutory authority. I regard it as a deplorable movement because its effect will certainly be to prevent the best citizens from entering public life. There is sufficient difficulty in getting able men with leisure to offer their services to the community even now, when it is known that they will receive the honour and respect of their fellow-citizens; but who would seek to serve a community if he knew that his every action would be canvassed and criticized by an irresponsible body? Probably this is the intention of some, because, if better men are scared away, then will be the opportunity for those who dominate the associations; and Town Councils will, in the result, be filled with mediocrities, or worse. I am led to make these remarks by the circumstance that this week I am obliged to take notice of such interference with gas-works management in three different places—Dundee, Falkirk, and Hamilton. In Dundee, it was at a meeting of the First Ward Committee that the subject was brought up by Mr. A. Anderson. I am sorry to see that Treasurer Ritchie was present at the meeting, and took part in the proceedings. He would, I think, have acted a more dignified part if he had not. Mr. Anderson complained that whereas two years ago his gas bills never amounted to more than 12s. or 13s. per quarter, recently they rose to 16s. and 19s.; while for last quarter the bill was 25s. He was sure—these grumblers always are—that no more gas was burned in his house than before. He was told by a man who had a big bill that a leak had been discovered in a pipe, and the question was whether an occupier was obliged to pay for gas which was not burned. To this Treasurer Ritchie replied that if the gas went through the meter the occupier had to pay for it, whether it was burned or not; but he thought it had been decided that if the pipes were defective, the occupier would have a case against the landlord. If a gas bill were too large, by informing the officials at the gas office the meter would be tested, and if found registering wrongly, an abatement would be given. A gentleman who was present said there was a great deal of squaring at the gas office; if people complained, they got a deduction. Treasurer Ritchie asked for an instance of this, because a deduction was only made if the meter was found to be defective. Mr. Anderson then drew attention to a statement which had appeared in a newspaper, to the effect that coal-trimmers at the gas-works had had their wages reduced, and he asked what were the facts of the case. Again Treasurer Ritchie obliged with the explanation that three coal-trimmers had had their wages reduced, and that they had left their work. Mr. Anderson wanted to know if the Gas Manager was instructed by the Gas Committee to reduce the wages, and Treasurer Ritchie said he was not. This is the sort of interference which, if encouraged, would make the lives of public men and officials unbearable. In this instance, it was an unnecessary and impertinent interference.

In the case of Falkirk, there is some show of reason for the public taking an interest in gas matters at present, because the Town Council are confessedly in sore need of direction upon them. A meeting of electors of the Middle Ward was held on Thursday evening, at which a protest, signed by 69 proprietors of residential property in the neighbourhood of Parkhouse, and by six tenants, against the Parkhouse site being adopted for new gas-works, was read. The protest was followed by a petition to the Town Council to take into serious consideration the unsuitability of the site, and the nuisance that would be created and the deterioration of the petitioners' properties in connection therewith. Mr. D. Moffat moved that they protest against the proposed erection of gas-works at Parkhouse, and that the representatives of the ward be instructed to take such steps as they may consider necessary to see that the protest be given effect to, and that a copy of the report be sent to the Town Clerk for presentation to the Town Council. Several of the members of that body attended the meeting, and moved that no protest be sent to the Council. They did not regard the site as an ideal one; but it was already their own property, and if they did not utilize it, they would lose about £14,000 which they have expended upon the erection of a gasholder there. There was a long discussion upon the subject, and then the motion was adopted by a large majority; the only supporters of the counter-motion being members of the Council.

At Hamilton, all the trouble has arisen over a proposal to construct a railway siding into the Corporation gas-works. The electors of the Second and Third Wards met on Tuesday, and condemned the proposal. It is difficult to understand what the ground of opposition is; and therefore it almost seems as if the whole case is not being made public. I can perceive that the Caledonian Railway Company, who are to make the siding, will derive immense benefit from it, because they will be able by it to reach other works, either existent or to be erected. But that should rather be a recommendation to the scheme than otherwise, because the town would also benefit by the improvement of trade in the district. The promoters anticipate a saving of something like £1300 a year from the working of the siding and of coal-handling plant which it is proposed to erect within the gas-works. At present, coal is carted from local pits into the works. This employment would come to an end on the opening of the railway siding; and, of course, the carting interest will oppose the railway. The grounds of opposition stated are the dangers which would be found to arise in the working of a level crossing, and that a loss instead of a profit may be looked for. The latter is a hypothetical objection, entirely unsupported by any facts which exist. The former objection is met by the fact that the Town Council have agreed to the introduction of electric street cars into the town, and the speed at which they will be run will greatly exceed that of the railway trains into the gas-works, with corresponding dangers out of all proportion to what there will be on the railway. But, notwithstanding that the opposition to

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the proposed siding has no ostensible foundation in fact or in reason, it finds supporters in the town—so much so that at a large public meeting no one would second a motion in favour of the railway scheme. This exhausts my review of the action of ratepayers; and my excuse for entering upon the subject at such length is that it is a new element which promoters of pubic works will have now to deal with.

Municipal coal has again been tabled in the Glasgow Town Council, as a subject for consideration. Mr. Maxwell, who is a leading man in the co-operative movement in Scotland, has given notice of a motion to the effect that, in view of the recurring periods of scarcity in the coal supply, caused by the stoppages resulting from disputes between owners and miners, and of the excessive profits exacted during such times of scarcity, which tend to the injury of local industries, and serious hardship to the community, it be remitted to a Special Committee to consider and report as to the advisability of purchasing or leasing coalfields, so that coal could be supplied for the use of the various departments of the Corporation, and to consumers within the municipal area. The subject is a large one. It has been discussed by the Corporation once or twice before; but they have never felt themselves at liberty to go on with any scheme which has been proposed. A favourite proposal with the class of councillor who is impressed with this description of public policy, is that the Corporation should work out the coal which is known to exist below the city—a much smaller matter than the purchasing or leasing of coalfields; but even this has not recommended itself to the majority of the councillors.

In the action by Messrs. D. & W. Chapel, solicitors, against the Corporation of Arbroath, in which a sum of about £35 is in dispute—being a balance said to be due for work done in connection with the Corporation gas undertaking, of which Mr. D. Chapel was Clerk—Sheriff Substitute Lee has allowed a proof upon the question of whether the Corporation employed the pursuers to do the work. The Corporation are willing to pay the sum sued for; but the Auditor has taken up the position that the work charged for was covered by Mr. Chapel's salary.

On Tuesday evening, the Corporation of Falkirk inaugurated an electric lighting installation which they have constructed under a Provisional Order. There are at present some 35 arc lamps in the streets, with two incandescent electric lamps upon each lamp-post, which take the place of the arc lamps after midnight. The private customers number about 45. After the current had been switched on, a banquet was held in the Town Hall.

We have received from the British Prometheus Company, Limited, of Kingston-on-Thames, a catalogue of their heating and cooking appliances. The Company claim that with electrical energy at 2d. per unit, a pint of water can be raised from 60° Fahr. to boiling-point for about one-tenth of a penny, and a gallon of water from the same temperature to 100° Fahr. (the heat usual for baths) for about one-eighth of a penny.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March 7.*

Sulphate of Ammonia.

In the early part of the week, there was considerable reselling at a shade below last week's figures; but towards the close, the market has assumed a firmer tone, and the closing quotations f.o.b. Hull and Liverpool are £12 11s. 3d. to £12 12s. 6d. per ton. Supplies in Scotland continue scarce, and the nominal quotation f.o.b. Leith is £12 15s. per ton. Notwithstanding the firmer spot market, there has been speculative selling abroad for delivery over near months at a substantial discount on prompt prices. Makers, however, are firm at last week's quotations; but no first-hand business has transpired.

Nitrate of Soda.

This is firm at 9s. 1½d. to 9s. 3d. per cwt.; but holders do not seem in a hurry to advance prices, notwithstanding the fact that deliveries from United Kingdom and Continental ports, January-February, have been nearly 50 per cent. in excess of those for the same period of 1902.

LONDON, *March 7.*

Tar Products.

There is nothing of any importance to advise. Pitch is decidedly easier for forward delivery. Foreign consumers do not seem at all anxious to purchase at existing prices; while distillers are naturally wishful to cover their purchases of tar made at high rates. For prompt delivery the demand remains good; but principally for home consumption. Benzol is very quiet. There are sellers of 50-90 per cent. at 8½d.; but consumers will not pay more than 8d. for early delivery. In 90 per cent. there is a little more inquiry for forward; but prompt delivery is neglected. Some quantity of toluol is offering for early delivery at 7½d. Consumers will not, however, at present purchase on these terms. A fair business is reported in anthracene for forward delivery; but prices have not transpired. In solvent, there is nothing to advise. There is really no business doing in the article. Crude carbolic is in better demand, and 1s. 6d. is being freely offered for prompt delivery; but makers as a rule ask 1s. 6½d., and in some instances 1s. 7d. There is more inquiry for crystals; but recent contracts have been taken at very low prices. Creosote is decidedly firm in London; but in the North there is more offering, and prices are easier.

The average values during the week were: Tar, 23s. to 28s. Pitch, London, 58s. to 60s.; east coast, 56s. to 57s.; west coast, 54s. 6d. to 55s. Benzol, 90 per cent., 9½d. to 9⅝d.; 50-90 per cent., 8d. to 8½d. Toluol, 7d. to 7½d. Crude naphtha, 3½d.; solvent naphtha, 8½d. to 9½d.; heavy naphtha, 9d. to 10d. Creosote, London, 1 1/16d.; North, 1⅛d. to 1⅜d. Heavy oils, 2d. to 2½d. Carbolic acid, 60 per cent., 1s. 6d. Naphthalene, 35s. to 55s.; salts, 25s. to 27s. 6d. Anthracene, "A" quality, 1⅜d. to 1½d.; "B" quality, 1d. nominal.

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THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

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Sulphate of Ammonia.

The market was a little easier in the beginning of the week, but closes very firm. In Hull, business was done late in the week at £12 8s. 9d.; but there are now buyers at £12 10s. for prompt delivery. The Gaslight and Coke Company quote £12 15s. for March-April, but would accept £12 10s. for May-September. Another large London Gas Company are reported to have sold at £12 13s. 9d. for March only. In Leith, the demand appears to be very good, especially for prompt delivery, and makers are reported to have declined £12 12s. 6d. and even £12 13s. 9d. for immediate shipment. In Liverpool, the market is quiet. Business is reported at £12 10s. for prompt shipment.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The question just now most agitating the coal trade of this and other Midland districts is the possible outcome of the attitude that has been taken up by the Miners' Federation with regard to the conditional wages settlement in South Wales. There are undoubtedly apprehensions that some serious trouble in the coal trade may be the result, and already there is talk of a strong combination of coalowners throughout the whole of the kingdom, with the object of resisting the unwarranted dictation of the Miners' Federation regarding the South Wales settlement. There is little doubt that if the Miners' Federation decide upon extreme measures with a view to upsetting the three years' settlement in South Wales, they will be met by equally strong measures on the part of the coalowners; and this raises a very serious prospect in the not far distant future. So far as trade is concerned, the position remains unsatisfactory for collieries as regards all descriptions of round coal. The absence of anything like the ordinary winter's demand for house-fire consumption is not on'y sending large surplus supplies on the market, which are pushed for clearance sale at low-cut figures, but is bringing about an early resort to short time. Some of the best coal collieries in Lancashire are not running more than three days, and it is exceptional where house-coal collieries are putting in more than four days a week. The depression in the house-coal trade, of course, indirectly affects the lower descriptions which are used for steam and forge purposes, and will no doubt have a considerable influence on prices when gas-coal contracts come forward for renewal. There is no actually quoted reduction in the list basis rates at the Lancashire collieries, which for best Wigan Arley range from about 14s. and 14s. 6d. to 15s. 6d. per ton for some of the special sorts, 12s. and 12s. 6d. to 13s. for the commoner sorts of Arley and Pemberton four feet, and about 10s. to 11s. for common house-fire coals at the pit. These prices are, however, becoming difficult to maintain in the face of outside competition at lower figures, and with a continuance of present conditions, some official reduction in prices may possibly be forced on before very long. With regard to steam and forge coals, quoted prices are about maintained at late rates; but on clearance sales, especially for shipment, there are some very low-cut rates. The inland demand is moderate for iron making, steam, and general manufacturing purposes, with prices ranging from about 8s. and 8s. 3d. to 8s. 9d. and 9s. at the pit. For shipping orders, some extremely low prices are reported, unscreened coal being offered at under 9s.; and screened at 9s. 3d. to 9s. 6d., with only in exceptional cases more than 10s. being got for good qualities of steam coal delivered at the ports on the Mersey. The restricted quantity of round coal just now being screened, and the short time which pits are working, is, of course, curtailing the quantity of slack offering on the market, either from Lancashire or outside collieries, and is keeping up prices for all descriptions of engine fuel. Although no advance on late rates has been obtained, the tendency is to harden, and at the pit-mouth common slacks range from 4s. 3d. to 4s. 9d. per ton, medium sorts 5s. 6d. to 5s. 9d., with the best qualities firm at 6s. 6d. to 7s.

Northern Coal Trade.

The dulness in the coal trade seems to be increased, partly through the falling off in the demand from the United States, and partly through the delay in the arrival of collier steamers. Some of the more northern collieries have had to work short time in consequence; and it will be readily seen that the bright weather has lessened the consumption of gas coals. Best Northumbrian steam coals are 10s. 3d. to 10s. 6d. per ton f.o.b., second-class steams are quiet at 9s. to 9s. 6d., and steam smalls are rather scarce at about 5s. 9d. The gas coal trade has been sustained by the large contracts, the deliveries on which are very heavy; but it is at the cost of heavier stocks with some of the consumers. Prices are now lower for gas coal for occasional sales—from 8s. 3d. to 9s. per ton f.o.b., according to quality. One or two small contracts for export have been settled, at prices that are thought to be about 9s. per ton f.o.b., but which are decided generally by the rate that may be allowed for the freight. So far as is known, nothing is yet done as to the large contracts for gas coals for the South; but it is expected that negotiations will be generally begun in the course of two or three weeks. Some reduction in the price seems to be expected. Gas coke is rather irregular, influenced probably by the extent of the contracts that specific producers may have. The quotation this week on the Newcastle Exchange has been from 12s. 6d. to 13s. per ton f.o.b., the lessening production tending to steady the price.

Scotch Coal Trade.

Trade has been quiet during the week, which is not unusual at this season of the year. It is reported that at some collieries there has been difficulty in disposing of the output. Splint has been in poor demand, and the price for it has been reduced by 1s. per ton for the best qualities. The prices quoted per ton f.o.b. Glasgow are: Main, 8s. 3d. to 8s. 6d.; ell, 9s. 3d. to 10s.; and splint, 10s. The shipments for the week were 145,395 tons—a decrease of 21,440 tons upon the previous week, but an increase of 1154 tons upon the corresponding week of last year. For the year to date, the shipments have been 1,481,091 tons, or 52,009 tons more than in the same period of 1902.

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APPLICATIONS FOR LETTERS PATENT.

4189.—ROWBOTHAM, W., "Gas and like engines." Feb. 23.
4227.—DARBY, W., and DARBY, I., "Cooking-ovens in conjunction with bunsen or other burners." Feb. 23.
4237.—GRAHAM, M., "Hot-coke conveyors." Feb. 23.
4244.—GILL, H. V., "Controlling currents of gas or electricity." Feb. 23.
4296.—MEIKLE, J. & J., "Gas-producer furnace." Feb. 24.
4303.—TOURNIER, V. C., "Rotary gas and oil engine." Feb. 24.
4371.—LAURIDSEN, F., "Igniting gas-lights." Feb. 24.
4408.—WEATHERHOGG, G. W., "Petroleum vapourizers and hydrocarbon gas-producers for lighting, heating, and motive power." Feb. 25.
4447.—BHISEY, S. A., "Gas stoves and radiators." Feb. 25.
4448.—ALZUGARAY, J. B. DE, and MERCER, W. A., "Recovering cyanogen or cyanogen compounds." Feb. 25.
4449.—CARPENTER, C. C., "Incandescent gas-burners." Feb. 25.
4464.—PETERS, C., "Producers for semi-water gas." Feb. 25.
4478.—LEWIS, F. M., "Lamp-posts and reflectors therefor." Feb. 25.
4510.—CROSSLEY, W. J., and WEBB, W. LE P., "Internal combustion engines." Feb. 26.
4513.—GROSSMAN'S CYANIDE PATENTS SYNDICATE, Ltd., and GROSSMAN, J., "Manufacture of cyanides, and the recovery of bye-products." Feb. 26.
4517.—COOK'S AIR COMPRESSORS AND PUMPS, LTD., and RICHARDSON, R., "Rotary engines, pumps, and compressors." Feb. 26.
4518.—KEITH, J. & G., "Lighting devices for incandescent gas-burners." Feb. 26.
4555.—STROUD, L., and GITTOS, J. G., "Carburettors." Feb. 26.
4564.—TOEDT, F. W., "Gas-engines." Feb. 26.
4568.—DICK, F. W., "Removing suspended matter from gases." Feb. 26.
4589.—RAMSBOTTOM, R., "Mantle supports for incandescent gas-burners." Feb. 27.
4602.—CROSSLEY, W. J., and RIGBY T., "Gas-producers." Feb. 27.
4604.—LONGRIDGE, C. C., "Gas and oil engines." Feb. 27.
4693.—SIMMANCE, J. F., and ABADY, J., "Photometrical apparatus." Feb. 28.

Artesian Wells in London.—Messrs. C. Isler and Co. have just tapped a supply of water at Messrs. C. Hammerton and Co.'s brewery, Stockwell, where an artesian bored tube well, 11½ inches in diameter and 400 feet deep, has been completed. The deepest strata met with were those of the blue clay (82 feet) and chalk and flints (187 feet). The supply is raised by means of compressed air; and the minimum yield is 320,000 gallons per day. It is stated that the water level is not affected by pumping, which shows that strong underground springs exist in this part of London.

An Amicable Agreement on the Burgess Hill Gas Bill.—In proposing the adoption of the proceedings of the General Purposes Committee at a recent meeting of the Burgess Hill District Council, the Chairman made a statement with regard to the Council's attitude toward the Gas Company's Bill. The Council, he said, gave the Gas Committee full power to meet the Company and settle the question between them as to whether they should petition Parliament against the Bill, or, if they could get certain concessions, come to terms with the Company. He was glad to be able to report that at a round-table conference, which lasted some two or three hours, they went through the Bill, with the result that the Company made certain concessions to the Committee; and they, in return for these concessions, had agreed not to oppose the Bill. The matter, therefore, was amicably settled; and he thought the ratepayers and the Council were to be congratulated on the way in which the whole matter had been carried out, as they had been saved the unpleasantness and expense of legal proceedings. Another member of the Council stated that the Directors of the Company met them very fairly indeed. The proceedings were confirmed. In this matter, the District Council consulted Messrs. W. A. Valon and Son; and the Company Messrs. Corbet Woodall and Son—the final conference taking place at Burgess Hill on Thursday last, when Mr. Arthur Valon appeared with the Parliamentary Committee of the District Council, and Mr. Harry Woodall with the Directors of the Gas Company.

Charge for Water for Public Institutions.—It has been decided by the Newton Abbot Board of Guardians to present a petition to Parliament praying to be heard in opposition to the Torquay Corporation Water Bill. The ground of opposition is that the Corporation propose by one of the clauses of the Bill to take power to charge for water supplied to public institutions by meter instead of on the rateable value. In the course of a discussion on the subject, it was stated by Mr. Mortimer, one of the Guardians representing Torquay, that in the year 1898 the quantity of water consumed in the workhouse was 2,647,000 gallons; and, the charge being by meter, the payments amounted to £178 13s. 6d. In 1899, when the system was altered, and they came to pay upon the rateable value, the quantity used was 3,514,000 gallons. It seemed to him that this meant that there was very great waste, while as the payment was only £50, the Torquay Corporation lost £120 by the change. The charge by meter was at the rate of 1s. 8d. per 1000 gallons; but when they paid on the rateable value, it dropped to 3½d. The Chairman (Mr. W. Vicary) contended that this only confirmed the Board's case, which was that in charging by meter the Corporation were illegally exacting from the Guardians upwards of £100 a year more than they had a right to charge. Now they were seeking by a Private Bill to upset the law of the land. The Clerk said that, as a matter of fact, the payment in 1899 did not come to as much as £50, because that year included one quarter in which the charge was by meter and three quarters in which it was on the rateable value. The large increase in the consumption that year was accounted for by additions to the buildings, including a new laundry. The Torquay Guardians and some others voted against the proposal to oppose the Bill; the figures being 33 for the opposition and 12 against it.

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RICHMOND GAS STOVE AND METER CO., LD.

Suffocation by Gas.—On Monday last week, Dr. Wynn Westcott held an inquiry at Hackney respecting the death of Samuel Hart Baker, aged 55, a licensed victualler, lately residing at Lower Clapton. Mary Ann Baker, the widow, deposed that on the previous Wednesday her daughter lit the gas beneath a geyser in the bathroom, and prepared a warm bath for her father, about 4.45 p.m. Witness was then out; but on her return about 6.40 p.m., she learned that her husband had been found dead in the room. He was in the habit of taking a bath in the evening, and then going to bed. There was a window in the room, but it was shut. There was no chimney to the geyser, but there was a ventilator to the room. This was, however, closed on account of the high wind. The deceased was not in any trouble. Dr. G. Birch deposed that when he arrived at the house the gas was still escaping. The room was in darkness, the blind being down. He opened the window, and a little later found the gas-tap and turned it off. Death was due to suffocation by coal gas. It was not the main tap of the geyser that was turned on, but a small side one. The Jury returned a verdict of "Accidental death."

The Worksop District Council and the Water-Works—Nothing daunted by the refusal of the Local Government Board to sanction the purchase by the Worksop District Council of the undertaking of the Worksop Water Company, the Council still hanker after the property. At their meeting on Monday last week, the Special Committee appointed to negotiate for the purchase reported that at a special meeting that day they recommended that the Council offer the Company £36,000. Mr. Wells-Smith explained the position of affairs, and moved the resolution referred to, stating that the Local Government Board refused their sanction to the purchase, and he thought that if this plan were adopted probably the Board would consent to the scheme. Mr. Clark seconded the motion. Mr. Dougill moved, as an amendment, that before anything further was done in the matter a town's meeting should be called. Mr. Mokes suggested that the Council should accept the decision of the Board as final by letting the matter drop. Mr. Dougill thereupon withdrew his resolution, and seconded Mr. Mokes's amendment. Several speakers, however, supported the original resolution, which, on being put, was carried with two dissentients.

The Lauder Acetylene Burners, Limited, is the title of a Company which has just been registered with a capital of £3000, in £1 shares, to make, sell, and deal in the Lauder and other acetylene burners.

A very attractive little pamphlet on the Keith light has been prepared by the James Keith and Blackman Company, Limited, of 27, Farringdon Avenue, E.C., and it is being supplied to gas companies for use in canvassing.

Towards the close of the description of the new gas-works at Granton given in the "JOURNAL" last week, reference was made to the products works. We are asked to mention that the plant and machinery were supplied by Messrs. W. Neill and Son, of St. Helens.

An international exhibition will be held at Limoges from May to September this year. The exhibits will be comprised under a number of headings, including general mechanics, electricity, civil engineering, special applications of medicated alcohol to motive power, lighting and warming, &c.

The Industrial Freedom League are issuing in pamphlet form the speech delivered by Lord Avebury at the dinner of the London Chamber of Commerce which took place at the Trocadero Restaurant on the 21st of January. The speech was noticed in the "JOURNAL" the following Tuesday.

A Keith light installation, amounting to 11,300-candle power, has been used for lighting the gas exhibition just concluded at the Drill Hall, Carlisle. This is the first installation of the kind in the city; and it has given great satisfaction to the Corporation Gas Engineer (Mr. W. J. Smith) and all concerned with the exhibition.

The Fairbanks Company, of 78 to 80, City Road, E.C., are sending out descriptive catalogues of their power hammer (Dupont patent), Skinner chucks, and Reed pipe-fitters' tools. The last-named catalogue (No. 144) is the one in which our readers are most interested; and it will be found to contain illustrations of a great variety of tools. Accompanying the catalogues are leaflets entitled "Boiler-Room Talks" and "Facts about Re-Cut Files."

It will be seen by an announcement which appears elsewhere that the Southwark and Vauxhall Water Company are inviting tenders for an issue of 3 per cent. debenture stock, authorized under the provisions of the Act of 1898, redeemable at par 25 years from the date of issue. This is the third largest of the Metropolitan Water Companies, and supplies an area with a present population exceeding 800,000; and the gross revenue from water-rents, &c., for the year ended March, 1902, was £311,698, against £217,867 ten years previously.

In the report to be presented at the annual meeting of the Richmond Gas Stove and Meter Company, Limited, next Thursday, the balance standing to the credit of the profit and loss account for the past year, including the balance brought forward (£2897) is shown to be £23,771. This the Directors recommend should be appropriated as follows: Dividend of 6 per cent. on the preference capital, £5786; dividend (free of income-tax) at the rate of 10 per cent. on the ordinary share capital, £7681; shares and cash allocated to the employees' profit-sharing fund, £1800; depreciation of buildings, &c., £3735; reserve fund (making this fund up to £17,000), £1309; and branch reserve fund, £1000—making a total of £21,311. This will leave £2460 to be carried forward, subject to the vote for the Directors' remuneration. Profound regret is expressed at the death of Mr. E. W. T. Richmond, the Chairman and Managing-Director of the Company, in September last; and the appointment of Mr. T. Dwerryhouse as his successor in the former capacity, and of Mr. H. M. Thornton as Vice-Chairman, is mentioned. The latter, in association with Mr. J. A. Ransome, will continue to manage the business. This, the Directors state, continues to be satisfactory. A noteworthy feature of the report is the announcement that, the term of five years for which the Company's profit-sharing scheme was arranged having expired, the Directors have decided, after careful consideration, not to renew it.

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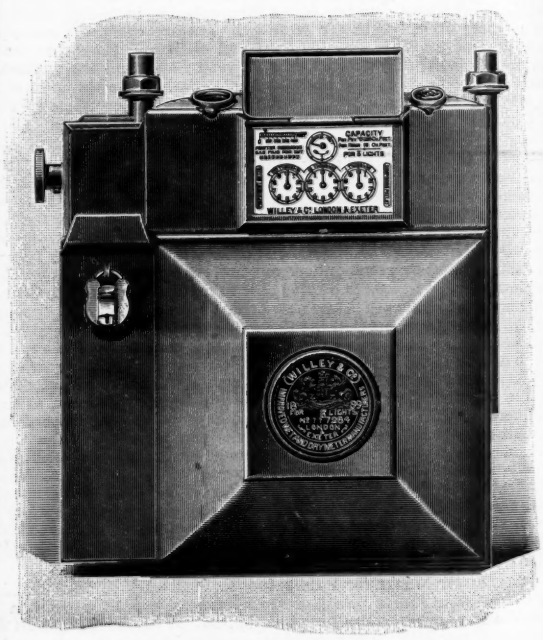

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WILLEY & CO., LONDON AND EXETER.

In the report which the Directors of the Davis Gas-Stove Company, Limited, will present to the shareholders next Thursday, the net profits for the past year are stated to be £16,209. Adding the amount brought forward, there is a sum of £17,794 available for distribution. Deducting from this the dividend paid on the 5½ per cent. preference shares, and the interim dividend paid on the ordinary shares at the rate of 8 per cent. per annum for the half year ending the 30th of June, amounting together to £5575, there remains a balance of £12,219, which it is proposed to apportion as follows: £3515 to pay a further dividend on the ordinary shares at the rate of 12 per cent. per annum for the six months ending Dec. 31 (less income-tax), £6000 to be added to the reserve account, and £668 (less income-tax) due to the Directors and Managers—leaving £2036 to be carried forward.

The report to be submitted at the general meeting of John Wright and Eagle Range, Limited, at Birmingham, next Thursday, states that the profit for the year ending Dec. 31. after providing for contingent reserve and charging Directors' fees, Managing-Directors' remuneration, and depreciation on the buildings and plant, amounts to the sum of £47,614. After adding the balance of £4742 brought forward, and deducting the £12,746 paid as interim dividend in August, there remains at disposal £39,611, which the Directors recommend should be appropriated as follows: A dividend at the rate of 6 per cent. per annum for the half year on the preference shares (less income-tax), £2391; a dividend of 2s. 6d. per share (free of income-tax) on the ordinary shares, £25,875; and to reserve, £5000. This will leave a sum of £6345 to carry forward to next year.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ASSISTANT WATER ENGINEER. Plymouth Corporation. March 19.
CHIEF WATER ENGINEER. Glasgow Corporation. March 31.
CLERK AND COLLECTOR. Holmfirth Gas Company.
DRAUGHTSMAN. R. & J. Dempster, Manchester.
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CONDENSER. Redditch Gas-Works.
PURIFIERS (4). Gas-Works, Lower Gornal.
PURIFIERS (3). Linlithgow Gas Company.

Meetings of Companies.

BRITISH GASLIGHT COMPANY. March 25.
OTTOMAN GAS COMPANY. March 17.

Sales of Stocks and Shares.

BARKING GAS COMPANY. March 28.
BRENTFORD GAS COMPANY. March 31.
CITY OF ELY GAS COMPANY. March 18.
CROYDON GAS COMPANY. March 18.
DORKING GAS COMPANY. March 24.
GRAYS GAS COMPANY. March 31.
HASTINGS AND ST. LEONARDS GAS COMPANY. March 18.
HASTINGS AND ST. LEONARDS GAS COMPANY. March 31.

Sales of Shares (*continued*)—

LEA BRIDGE GAS COMPANY. March 18.
LOWESTOFT WATER AND GAS COMPANY. March 18.
ROMFORD GAS COMPANY. March 24.
SOUTHWARK AND VAUXHALL WATER COMPANY. March 17.
SWANAGE GAS AND WATER COMPANY. March 24.
WORTHING GAS COMPANY. March 24.

Shares Wanted in C. & W. Walker, Ltd., No. 3993.

TENDERS FOR

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CONWAY GAS DEPARTMENT. Tenders by March 23.
MACCLESFIELD GAS DEPARTMENT. Tenders by March 16.

Benzol.

READ HOLLIDAY AND SONS, Huddersfield. Tenders by March 14.

Carbon.

GLASTONBURY GAS-WORKS.

Coal and Cannel.

DARLINGTON GAS DEPARTMENT. Tenders by March 19.
DARWEN GAS DEPARTMENT. Tenders by March 25.
MILFORD HAVEN GAS DEPARTMENT. Tenders by March 16.
WINDSOR GAS COMPANY. Tenders by April 7.

Coke.

HUDDERSFIELD GAS DEPARTMENT. Tenders by March 10.

Engine and Exhauster.

DEVONPORT GAS DEPARTMENT. Tenders by March 23

Fire-Clay Goods.

TIPTON GAS DEPARTMENT. Tenders by March 23.

Gasholder Tank.

ABERDARE GAS COMPANY. Tenders by March 20.

Gasholders.

ABERDARE GAS COMPANY. Tenders by March 20.

Meters, &c.

LEEDS GAS DEPARTMENT. Tenders by March 23.

Oil for Gas Making.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by March 23.

Purifiers, &c.

FENTON GAS DEPARTMENT. Tenders by March 21.

Retorts.

MIDDLETON GAS DEPARTMENT (Re-erection). Tenders by March 12.
TIPTON GAS DEPARTMENT. Tenders by March 23.

Roof Shed.

FENTON GAS DEPARTMENT. Tenders by March 14.

Sulphuric Acid.

WORKINGTON GAS DEPARTMENT.

Tar.

COLNE GAS DEPARTMENT. Tenders by March 31.
CONWAY GAS DEPARTMENT. Tenders by March 23.
LEEDS GAS DEPARTMENT. Tenders by April 18.
MACCLESFIELD GAS DEPARTMENT. Tenders by March 16.
TONBRIDGE GAS COMPANY. Tenders by April 3.

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COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

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READ HOLLIDAY & SONS, Limited, Huddersfield, invite TENDERS for the supply of 50,000 Gallons of Nineties BENZOL, delivered f.o.r. Huddersfield, casks free or returnable, for delivery over the next Six or Twelve Months in about equal monthly quantities.

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Apply, by letter, stating all Particulars, to No. 3983, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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Apply, by letter, stating Age, Experience, and Wages required, to A. E. BUCKLEY, Manager and Secretary.

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THE Water Committee invite applications for the above post. Candidates must have had considerable experience in a Water-Works Office, and have a thorough knowledge of Water-Works Undertakings, must be accurate Surveyors, expert at Levelling, good Draughtsmen, and have had experience in the laying of large Mains.

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Applications, accompanied by not more than Three recent Testimonials, endorsed "Assistant Water Engineer," should be sent to the undersigned not later than Twelve o'clock noon on Thursday, March 19, 1903.

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GLASGOW CORPORATION.
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TO WATER ENGINEERS.

THE Corporation invite Applications for the position of CHIEF ENGINEER of their Water Department.

Applicants, beside possessing practical experience in all matters relating to the construction of Water-Works and the distribution of water, must be specially qualified to prepare Designs and Specifications for, and to supervise the construction of, such works.

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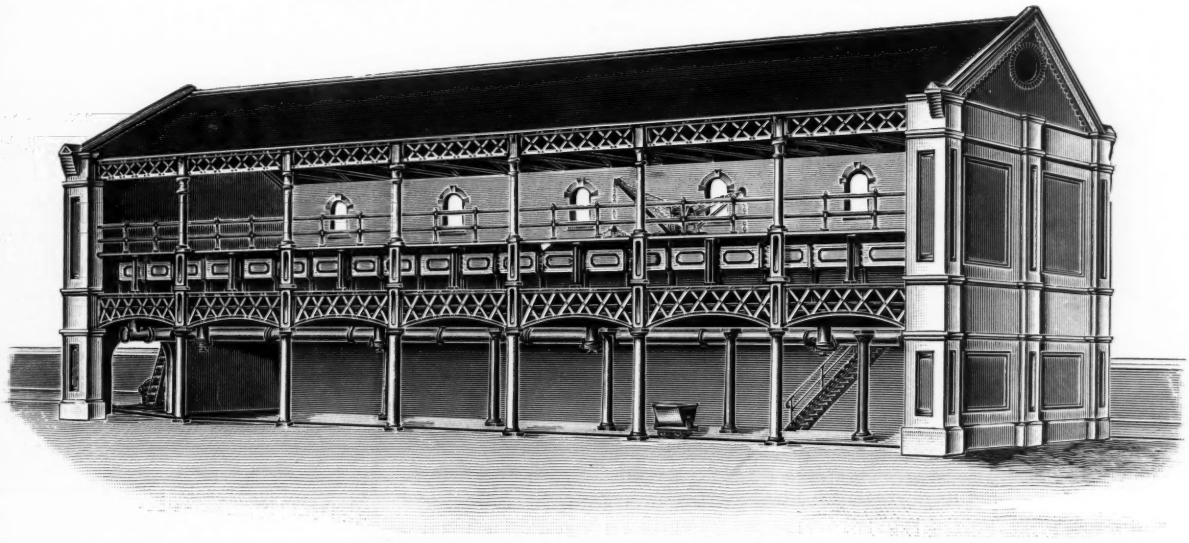

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Water Engineer.

Municipal Buildings, Plymouth,
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PURIFIERS

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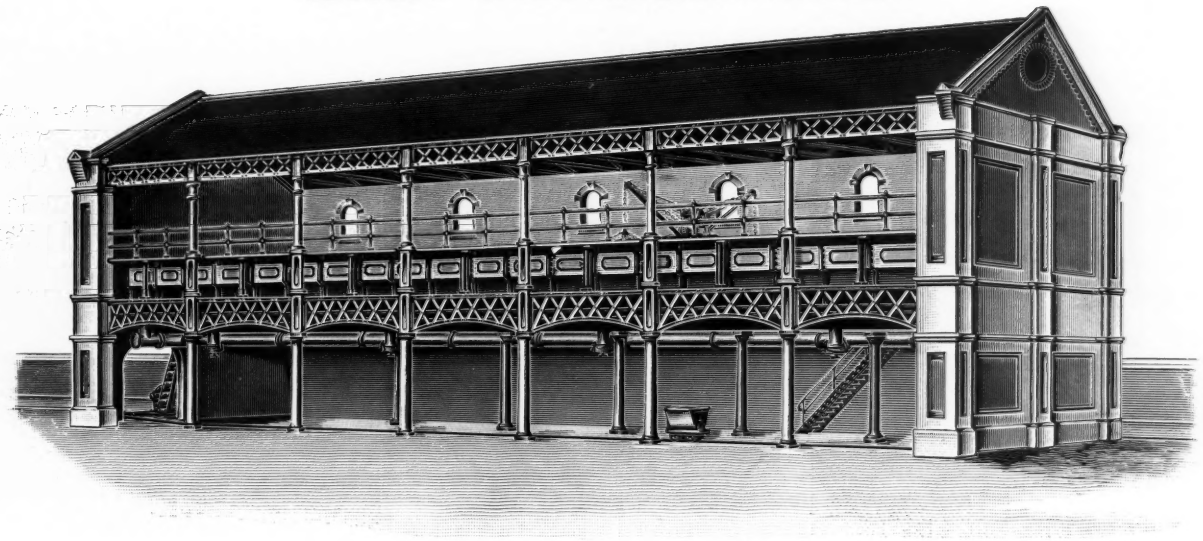
Initial Cost, Gas, Ground Space, and Connections.



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A BARGAIN—Water-Cooled Condenser in perfect condition. Capacity 25,000 cubic feet per 24 Hours.
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Kirkham WASHER-S RUBBER, 300,000 cubic feet per diem., with Engine and 8-inch Valves and Connections.
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One 6000 cubic feet per hour BEALE ROTARY EXHAUSTER.
One 3000 cubic feet per hour BEALE ROTARY EXHAUSTER.
One 3-Horse Power Horizontal STEAM-ENGINE.
One 4½-Horse Power Crossley GAS-ENGINE (late type, recently erected), including Pulleys, Shafting, and Belts.
The whole of the above is in good working order, and can be seen at work if desired.
For further Particulars, apply,
STEPHEN TEMBLETT,
Engineer and Manager.
Gas Offices, Andover.

BOROUGH OF COLNE.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the surplus TAR made at their Works during the Twelve Months ending March 31, 1904.
Particulars may be obtained on application to the undersigned.
Sealed Tenders, endorsed "Tar," must be addressed to the Chairman of the Gas Committee, Gas-Works, Knotts Lane, Colne, Lancashire, and delivered not later than Tuesday, March 31, 1903.
The highest or any Tender not necessarily accepted.
FRED. THORPE,
Engineer and Manager.
Gas-Works, Colne,
Lancashire, March 6, 1903.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

GAS OIL.

THE Commissioners are prepared to re ceive TENDERS for the supply of about 4000 Tons of OIL suitable for Gas-Making purposes.
The Oil is to be delivered in Railway Tank-Waggons at the New Street Works, North British Railway, or alongside Leith or Granton Harbours.
The quantities, if by rail, are to be approximately equal Monthly deliveries.
The Commissioners do not bind themselves to accept the lowest or any Offer.
Further Particulars may be obtained upon application to the Chief Engineer and Manager, Mr. W. R. Herring.
Tenders are to be lodged by Ten o'clock a.m., on Monday, the 23rd of March, in sealed envelopes, endorsed "Tender for Gas Oil," and addressed to the undersigned.
JAMES M'G. JACK,
Clerk.
25, Waterloo Place,
Edinburgh, March 6, 1903.

THE Corporation of Middleton are prepared to receive TENDERS for the taking down and re erection of two beds of INCLINED RETORTS.
Further Particulars may be obtained from Mr. E. E. J. Anderson, Gas Engineer.
Tenders, endorsed "Tender for Inclined Retorts," to be addressed to the Chairman of the Gas Committee, and delivered at my Office not later than noon on Thursday, the 12th of March, 1903.
The Corporation do not bind themselves to accept the lowest or any Tender.
FREDERICK ENTWISTLE.
Town Clerk.
Town Hall, Middleton.
Feb. 28, 1903.

TENDERS FOR GAS COAL.

THE Directors of the Windsor Royal Gaslight Company invite TENDERS for 9000 Tons of High-Class GAS COAL, with option of taking 100 Tons per month in addition; to be delivered free to the Great Western Railway Station at Windsor during the Twelve Months ending the 30th day of April, 1904.
Deliveries to be made in such quantities and at such times as may be required by the Company.
Sealed Tenders, endorsed "Tender for Coal," to be sent by post to reach the undersigned by Tuesday morning, the 7th of April. Forms of Tender not supplied.
The Directors do not bind themselves to accept any Tender.
By order,
JOHN HENRY STRANGE,
Secretary.
2, Victoria Street, Windsor,
Berks, March 3, 1903.

TIPTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

FIRE-CLAY GOODS.

TENDERS are invited for the supply and delivery of Machine-made RETORTS, FIRE-BRICKS, FIRE-CLAY, &c., during the next Twelve Months, all to be delivered at the Tipton Gas-Works.
Specifications and Forms of Tender may be had on application to Mr. S. O. Stephenson, the Council's Gas Engineer and Manager.
The Council do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, endorsed "Tender for Fire-Clay Goods," must be delivered to the undersigned not later than first post on Monday, March 23, 1903.
J. W. WAPING,
Clerk to the Council.
Public Offices, Tipton.

CORPORATION OF DARLINGTON.
(GAS-WORKS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas-Works Committee of the above Corporation invite TENDERS for the supply of 35,000 Tons of freshly wrought GAS COAL, delivered at the Gas-Works Siding as required during the ensuing Twelve Months.
Further Particulars may be obtained from Mr. Frank P. Tarratt, Gas-Works Engineer, Darlington.
Tenders, endorsed "Tender for Gas Coal," to be delivered at my Office, Houndgate, Darlington, not later than March 19, 1903.
No pledge is given that the lowest or any Tender will be accepted.
(Signed) HY. G. STEAVENSON,
Town Clerk.
Town Clerk's Office,
Darlington, March 6, 1903.

CITY OF LEEDS.
(GAS DEPARTMENT)

TENDERS FOR DRY GAS-METERS.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the supply of DRY GAS-METERS to be delivered at their Meter Stores during a period of Twelve Months from receipt of order.
Each party tendering is required to send, on or before Monday, the 16th inst., Two sample 3-Light Meters (one of which is to be left open for examination), addressed to the Gas-Meter Works, Meadow Lane, Leeds.
Forms of Tender may be obtained on application to the undersigned, at the Offices of the Gas Department, Municipal Buildings, Leeds.
Endorsed Tenders addressed to the Chairman of the Gas Committee, at the latter address, to be delivered not later than Monday the 23rd inst.
The Gas Committee do not bind themselves to accept the lowest or any Tender.
R. H. TOWNSLEY,
General Manager.
Municipal Buildings, Leeds,
March 7, 1903.

LEEDS CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Corporation of Leeds are prepared to receive TENDERS for the purchase and removal of the GAS TAR to be produced at their several Gas-Works during One, Two, or Three years, commencing at noon on the 1st day of September, 1903, either on the sliding-scale basis or at a fixed price per ton.
Full Particulars and Forms of Tender may be obtained on application to the undersigned.
Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Tar," must be delivered at the Offices of the Gas Department, Municipal Buildings, on or before Saturday, the 18th day of April, 1903.
The Committee do not bind themselves to accept the highest or any Tender.
R. H. TOWNSLEY,
General Manager.
Gas Offices, Municipal Buildings,
Leeds, March 7, 1903.

BOROUGH OF WORKINGTON.
DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of SULPHURIC ACID for Twelve Months from April 1, 1903.
Full Particulars on application to the undersigned.
GEO. KEYTE,
Engineer and Manager.

TONBRIDGE GAS COMPANY.

TO TAR DISTILLERS.

THE Directors of the above Company invite TENDERS for their surplus TAR for a period of Three Years from the 1st of July next.
Full Particulars can be obtained on application.
Sealed Tenders, endorsed "Tender for Tar," to be lodged with the undersigned not later than the 3rd of April next.
The highest or any Tender not necessarily accepted.
JAMES DONALDSON,
Engineer and Secretary.

BOROUGH OF CONWAY.
(GAS DEPARTMENT.)

THE Gas and Lighting Committee invite TENDERS for the purchase of the TAR and AMMONIACAL LIQUOR to be produced at their Works during the Twelve Months ending the 1st of April, 1904.
Form of Tender may be obtained on application to me.
Sealed Tenders, endorsed "Residuals," to be delivered at my Office on or before the 23rd of March, 1903.
F. A. DELAMOTTE,
Gas Engineer.
Town Hall, Conway.

FENTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee of the above Council invite TENDERS for the construction and erection of Four PURIFIERS, on Green's System, together with Valves and Connections, and ROOF SHED over Purifiers, to be erected at the Gas-Works, Fenton.
The Drawings may be inspected, and copy of Specification obtained, on application to the undersigned.
Sealed Tenders, endorsed "Purifiers," and addressed to the Chairman, Gas-Works, Fenton, Staffs., to be sent in not later than Saturday the 21st of March, 1903.
The Council do not bind themselves to accept the lowest or any Tender.
ROBERT SUBTEES,
Engineer and Manager.
Gas-Works, Fenton, Staffs.,
March 4, 1903.

BOROUGH OF DARWEN.

TENDERS FOR GAS SLACK.

THE Corporation are prepared to receive TENDERS for the supply of GAS SLACK for One Year, to be delivered at the Gas-Works Siding in the Corporation Waggons.
Forms of Tender and all Information as to quantities may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.
Sealed Tenders, endorsed "Gas Slack," must be delivered to the undersigned on or before noon, Thursday, March 26, 1903.
No Tender necessarily accepted.
By order,
WILLIAM P. HALLIWELL,
Town Clerk.
Town Clerk's Office,
Darwen, March 3, 1903.

ABERDARE GAS COMPANY.

GASHOLDER AND STEEL TANK.

THE Directors of the above Company invite TENDERS for the erection of a THREE-LIFT GASHOLDER, of 150,000 cubic feet capacity, and STEEL TANK.
Copies of Specification, Conditions of Contract, and Prints of Plans may be had on application to Mr. Isaac Carr, M.Inst.C.E., Consulting Engineer, Farnworth, Widnes, on payment of two guineas, which will be returned on receipt of a *bona-fide* Tender.
Tenders, endorsed "Gasholder," addressed to Benjamin Jones, Esq., Chairman, Gas Company, Aberdare, must be delivered to the undersigned not later than the 20th inst.
EVAN JONES,
Secretary and Manager.
Gas-Works, Aberdare,
March 6, 1903.

URBAN DISTRICT OF MILFORD HAVEN.

TENDERS FOR GAS COAL.

THE Milford Haven Urban District Council are prepared to receive TENDERS for about 800 Tons of large GAS COAL, about 50 Tons of CANNEL COAL, and also about 200 Tons of BITUMINOUS STEAM COAL, to be delivered between the 1st of April, 1903, and the 31st of March, 1904. The whole of the Coal to be fresh Hewn, Clean, and free from Impurities.
Further Particulars and Forms of Tender can be obtained on application to the undersigned.
Sealed Tenders, endorsed "Tenders for Coal," addressed to the Chairman, Gas and Water-Works Committee, to be sent not later than the 16th of March next.
The Council do not bind themselves to accept the lowest or any Tender.
By Order,
THOMAS H. LEWIS,
Clerk.
Milford Haven,
Feb. 27, 1903.

BOROUGH OF DEVONPORT.

THE Gas Committee invite Tenders for the supply and erection of a combined STEAM-ENGINE and 40,000 cubic feet per hour EXHAUSTER.

Copies of Specification may be obtained on application to the undersigned.

The Committee do not bind themselves to accept the lowest or any Tender.

Tenders, to be addressed to the Town Clerk, Devonport, on or before Monday, the 23rd of March, 1903, endorsed "Tender for Exhauster"

SIDNEY E. STEVENSON,
Engineer and Manager.

Gas-Works, Devonport,
Feb. 23, 1903.

BOROUGH OF MACCLESFIELD.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Gas Committee are prepared to re-ceive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months commencing the 1st day of April next.

Tenders for the Tar or Liquor separately to be sent in not later than Monday, the 16th of March, 1903, addressed to the Chairman of the Gas Committee, Town Hall, Macclesfield, and endorsed "Tender for Tar, &c."

For Conditions, apply to Mr. E. L. Newbigging, Engineer, Gas-Works, Macclesfield.

The Committee reserve to themselves the right of accepting any Tender for the Tar or the Liquor separately.

The highest or any Tender not necessarily accepted.

ARTHUR T. PATTINSON,
Town Clerk.

Feb. 21, 1903.

COUNTY BOROUGH OF HUDDERSFIELD.
(GAS DEPARTMENT.)

SURPLUS COKE.

THE Corporation of Huddersfield invite TENDERS for the surplus COKE at the Gas-Works for the Year commencing on the 1st of April, 1903.

Particulars of approximate quantities and conditions may be obtained on application to the Gas Engineer and Manager, Huddersfield.

Sealed Tenders, endorsed "Tender for Gas Coke," must be delivered, free of charge, addressed in the handwriting of the Tenderer or his Agent, to the Town Clerk, Town Hall, Huddersfield, not later than Twelve o'clock at noon on Tuesday, the 10th day of March, 1903.

The Corporation do not bind themselves to accept the highest or any Tender.

By order,
F. C. LLOYD, Town Clerk.

Town Hall, Huddersfield,
Feb. 25, 1903.

BARKING GAS COMPANY.
INCORPORATED BY ACTS OF PARLIAMENT 1867 and 1903.

SALE BY TENDER OF 1800 ORDINARY SHARES OF £10 EACH,

Entitled to a Maximum Dividend of Seven per Cent. per Annum.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL by TENDER, 1800 of the above, being a portion of Additional Capital authorized to be raised by Resolution passed at an Extraordinary General Meeting of the Proprietors held on the 28th day of January, 1903, under the Powers of the above-mentioned Act.

Particulars and Conditions of Sale and Form of Tender may be obtained on application at this Office, and sealed Tenders must be sent in not later than Five o'clock in the afternoon of Saturday, the 28th day of March, 1903.

By order of the Directors,
STUART MORRIS,
Secretary.

Offices of the Company,
Gas-Works, Barking, Essex.

SOUTHWARK AND VAUXHALL WATER COMPANY.

SALE BY TENDER OF THREE PER CENT. DEBENTURE STOCK.

NOTICE is Hereby Given, that it is the intention of the Directors of the Southwark and Vauxhall Water Company to SELL BY TENDER, to be received at the Company's Office, Southwark Bridge Road, S.E., not later than Twelve o'clock (noon) on Tuesday, March 17, 1903, £100,000 DEBENTURE STOCK of the Company.

The Stock now for Sale is the first portion of the Capital authorized by, and to be issued under the provisions of, the Southwark and Vauxhall Water Act, 1898; and will be entitled from March 31, 1903, to interest at the rate of £3 per cent. per annum. It will be known as Debenture Stock "B," and may be redeemed at par at any time after the expiration of Twenty-Five Years from the date of issue, subject to Six Months' previous Notice of the intention to redeem.

Debenture Stock "B" will rank for interest *pari passu* with the other Debenture Stock of the Company, but before the Ordinary and Preference Stock and Share Capital. It is a lawful investment for Trustees.

For Particulars, Forms, and Conditions of Tender, apply at the Office of the Company, Southwark Bridge Road, S.E.

By order of the Board of Directors,
MONTAGUE WATTS.
Secretary.

Southwark Bridge Road,
London, S.E.
March 6, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, March 18, a Two o'clock, in Lots, the following STOCKS and SHARES—

LEA BRIDGE DISTRICT GAS COMPANY,
£1000 CONSOLIDATED ORDINARY STOCK.

HASTINGS AND ST. LEONARDS GAS COMPANY,
£800 CONVERTED STOCK.

LOWESTOFT WATER AND GAS COMPANY.
70 £10 ADDITIONAL ORDINARY SHARES.

CROYDON COMMERCIAL GAS AND COKE COMPANY,
£500 "C" STOCK.

WORTHING GASLIGHT AND COKE COMPANY,
100 £10 ORDINARY SHARES.

CITY OF ELY GAS COMPANY,
£1070 ORIGINAL STOCK.

Particulars may be obtained of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
DARKING GAS COMPANY.

NEW ISSUE OF 120 £25 "D" SHARES.

MR. ALFRED RICHARDS will sell the ABOVE BY AUCTION at the Mart, E.C., on Tuesday, March 24, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ROMFORD GAS AND COKE COMPANY LIMITED.

NEW ISSUE OF 640 £5 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 24, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SWANAGE GAS AND WATER COMPANY.

NEW ISSUE OF £5000 4½ PER CENT. PREFERENCE "WATER" STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 24, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the
WORTHING GASLIGHT AND COKE COMPANY.

NEW ISSUE OF 300 £10 SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, the 24th of March, at Two o'clock precisely, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

HASTINGS AND ST. LEONARDS GAS COMPANY.

SALE BY AUCTION OF £10,000 NEW ADDITIONAL FIVE PER CENT. ORDINARY STOCK,

Ranking for 5 per Cent. Dividend, subject to the Sliding-Scale, and entitled, in view of the Dividends being paid on the Company's existing Stocks, to £6 1s. per cent.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, the 31st of March, at Two o'clock, by order of the Directors.

The Company was established in 1832, and supplies Gas in the favourite and rapidly growing South Coast Health and Pleasure Resorts of Hastings and St. Leonards, as well as the adjacent districts. The total authorized capital is £770,000, of which £438,500 has been issued. The sales of gas have risen from 321 million cubic feet in 1893 to upwards of 433 millions last year. There are nearly 10,000 consumers; upwards of 6000 gas-stoves are in use; and, after paying the full statutory dividends to the 31st of December last, £43,373 was brought forward to the current half year as undivided profit, which is available for use as a reserve fund.

The New Capital is required to meet the continued increase in the Company's business. It will be issued free of stamp duty or other expense; and purchases can be made without charge either by the Secretary of the Company or the Auctioneer for investors unable to attend the Auction.

Detailed Particulars of Sale, with Form of Instructions for the Secretary or Auctioneer to purchase, obtainable post free at the COMPANY'S GENERAL OFFICES in Queen's Road, HASTINGS, or of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GRAYS GAS COMPANY, LIMITED.

NEW ISSUE OF 400 £10 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 31, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

Estate of Mrs. Banks, Deceased.

BRENTFORD GAS COMPANY.

£2220 CONSOLIDATED STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart E.C., on Tuesday, March 31, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 25th inst., at Twelve o'clock precisely, to transact the usual Business, and to declare the Dividend for the Half Year ended the 31th of December last.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 14th and RE-OPENED on the 26th inst.

By order of the Court of Directors,
H. B. CHAMBERLAIN,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 4, 1903.

OTTOMAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Offices of the Company, 9, Queen Street Place, Cannon Street, E.C., on Tuesday, the 17th day of March, 1903, at 12.45 in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December last, to declare a Dividend for the same period, to elect a Director and Auditors in place of those retiring by rotation, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 4th day of March until after the Meeting.

By order of the Board,
THOMAS GUYATT,
Secretary.

9, Queen Street Place, Cannon Street,
London, E.C., March 3, 1903.

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Author of "The Purification of Sewage and Water," "Lime, Mortar, and Cement," "Practical Photometry," &c.

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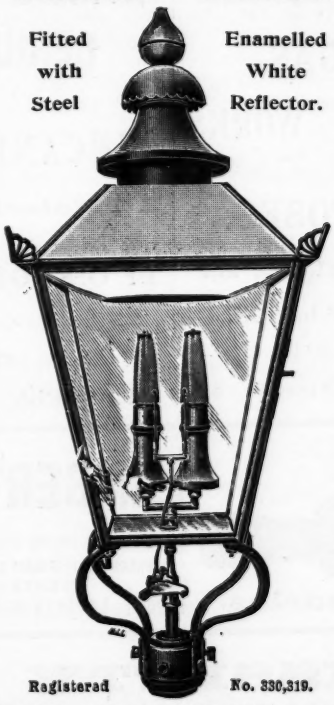

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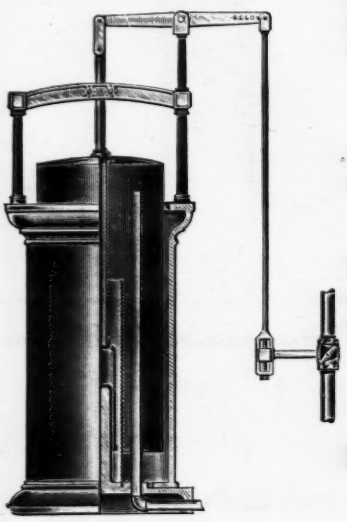

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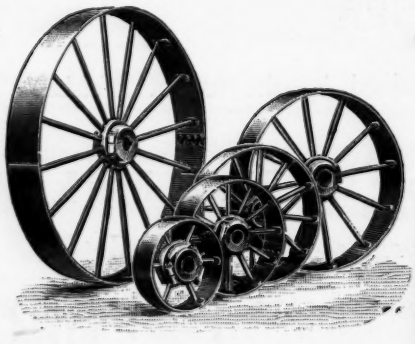

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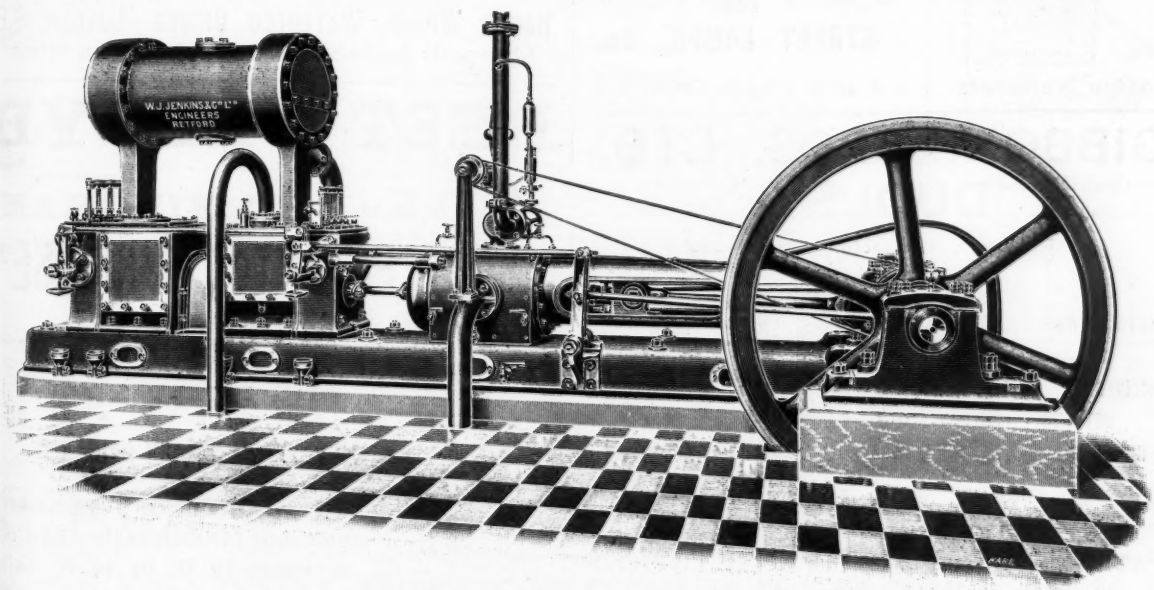

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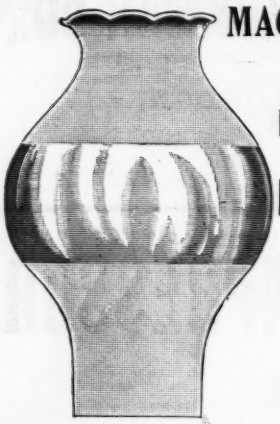

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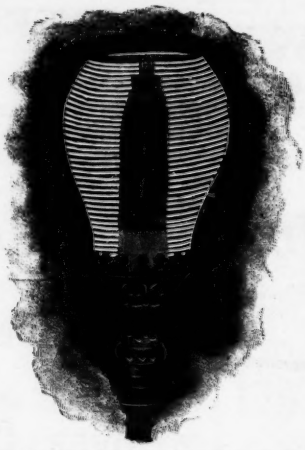

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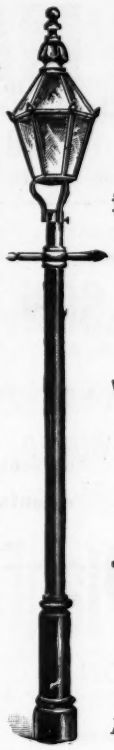

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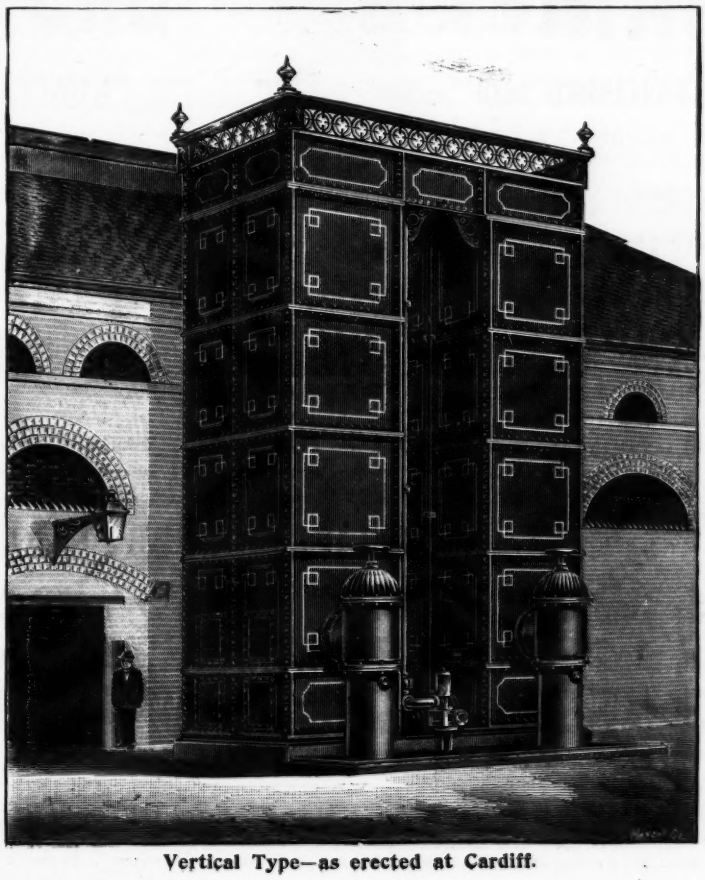

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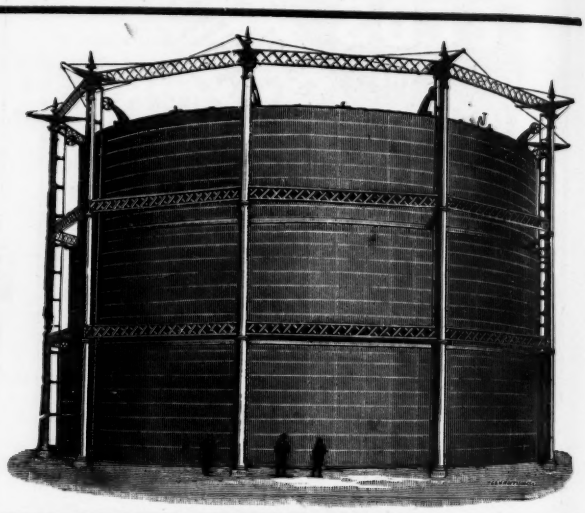

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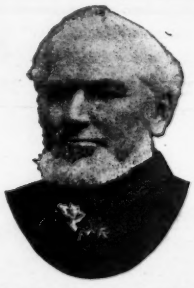

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